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QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXIX. JULY, 1912. PART 1.

Agriculture.

FORMS IN WHICH LIME MAY BE USED ON THE FARM.

Time was when the Queensland farmer had no troubles either with worn-out soils or with the manifold pests which now cause him so much trouble and expense; but, after land has been unceasingly worked for forty or fifty years, as is the case with many of our farms—both scrub, plain, and forest—it behoves the farmer to renovate the soil by means of more scientific farming, manuring, draining, irrigating, &c. Here and there we find heavy clay soils; elsewhere there are sour soils, and such soils are those to which the judicious application of lime is beneficial.

Realising the value of lime applications to soils, the Florida Experiment Station has issued the following bulletin, which conveys the information that of fifteen plants, arranged in the order they are benefited by the use of lime, sugar-cane is third on the list:—

Quicklime (CaO) is obtained by burning native limestone or shells. It combines with water with avidity, crumbles down to fine powder, and forms what is best known as slaked lime. During this process it increases about one-third in weight and about three times in volume.

Air-slaked lime differs from fresh slaked lime in that it contains a large amount of calcium carbonate. In deciding the condition in which to purchase lime, it is well to consider that 100 lb. of quicklime are equivalent to about 140 lb. of slaked lime, and 170 lb. of air-slaked lime.

Floats is finely ground phosphate rock, and may be used to advantage on lands rich in organic matter.

Besides furnishing lime, it also slowly furnishes phosphoric acid. If the soil is in need of lime, other forms are better for supplying the want.

Wood ashes contain from 30 to 50 per cent. of lime, and may be used with good effect. Cypress ashes may be had for nothing in many places in the State. They contain about 50 per cent. of lime, and ½ per cent. of potash, and may be used to advantage.

Calcium sulphate or gypsum is found in deposits in many parts of the country. Much of the lime in acid phosphate is in this form.

Marl is earthy matter which contains partly decomposed shells. Its use is limited to farms in close proximity to the deposits, since the cost of its transportation is quite high. It is not uncommon for a marl to contain both potash and phosphoric acid in addition to lime.

HOW LIME ACTS.—Lime enters into the composition of all plants, and is undoubtedly as much a plant food as potash, phosphoric acid, or nitrogen. A plant will not grow in the absence of lime, but this substance is so widely distributed in Nature that practically all lands contain sufficient lime to supply the needs of the plants that may be grown on it.

The benefit derived from an application of lime is due more to its chemical and physical action on the soil than merely an increase of lime available as plant food.

Without going into detail, the following are the chief chemical changes brought about through the agency of lime:—Lime as sulphate has the power to break up certain compounds containing potash in an unavailable condition. It also aids in the formation of double silicates of potassium and aluminium, in which form the potash, though available, is prevented from leaching out of the soil. It promotes a rapid decomposition of the organic matter in the soil, and causes its nitrogen to be converted into nitrates. This is the form in which nitrogen is best assimilated by plants. If there is an excess of soluble phosphoric acid in the soil, its tendency is to combine with compounds of iron and aluminium and become unavailable. The presence of lime prevents this, and is even believed to be able to decompose any iron or aluminium phosphates which are in the soil, so that the phosphoric acid may be utilised as plant food.

Thus it appears that lime, by its peculiar chemical properties, is capable of rendering available all three of the plant foods which may be in the soil in an inert form.

Another important function of lime is to correct the acidity of soils which are rich in organic matter. Such soils are frequently so sour that certain plants will not grow on them, yet they produce abundant crops after an application of lime. A moderate amount of lime also greatly facilitates the growth of nitrifying organisms which exist on

the roots of leguminous plants, and causes the nitrogen which these little helpers secure from the air to be converted into nitrates and in this form stored up in the soil.

PHYSICAL ACTION OF LIME.—Aside from its chemical action, lime when applied to stiff clay soils renders them more friable, easier to cultivate, and better able to supply moisture, heat, and air to the plants. Its use improves the texture of sandy soils, making them more compact and more capable of retaining moisture and fertilisers. It may be stated here, however, that sandy soils will not bear very heavy applications as will the heavy clay soils.

WHAT SOILS NEED LIME.—From foregoing statements it would seem that most soils would respond favourably to an application of lime. If a soil is decidedly acid or sour, lime may be applied with a great degree of assurance that benefit will follow. Its application to heavy clay soils will usually prove advantageous. The use of lime on poor sandy soils requires caution. When added to such soils it renders the little plant food in them available and tends to their rapid exhaustion. It is best in such cases to add liberal supplies of potash and phosphoric acid, and rotate the crops, using cow peas or velvet beans to supply the nitrogen and organic matter.

WHEN TO APPLY LIME.—In general it may be said that during the fall is the proper time for making application. If the land is sour, the application may be made just previous to planting. The same applies if only a small amount is to be used.

HOW TO APPLY.—In case quicklime is to be used, it may be placed in small piles at convenient intervals and a gallon of water poured on each pile. These should then be covered with earth to protect the lime from the air. The following day the lime should be spread as evenly as possible on the land and immediately incorporated in the soil with a harrow. If lumps of unslaked lime remain, the land should be harrowed a second time after a few days. It is important that the lime be thoroughly mixed with the soil, and it should never be applied and turned under. After screening the slaked lime, it may be applied to advantage with a grain drill or a lime spreader, if these implements are at hand.

HOW MUCH TO APPLY.—This depends largely on the character of the soil and the crops to be grown. It is considered better practice to use small quantities and to apply annually than to make heavy applications. Many, however, apply from 2 to 5 tons per acre at intervals of from five to ten years. Half a ton is a fair quantity for an acre of land possessing a moderate degree of fertility.

EFFECT OF LIME ON PLANTS.—All plants are not affected alike by lime. Most of them are benefited to a greater or less extent; some are indifferent; and a few are injured when grown on recently limed soil. The following is a list of the more common plants grown in Florida, arranged in the order in which they are benefited by the lime:—Lettuce, beets, sugar-cane, celery, onions, parsnips, cabbage, canteloupes, tobacco, egg plants, pepper, pea, fruits, corn, and cotton.

About the only plant grown in the State which is injured by the lime is the watermelon. This applies only when a moderate quantity is used, as peas and other legumes, corn, and cotton are injured by large quantities of lime. It may be said, in this connection, that it is better to avoid the use of lime on soils which are to be planted in potatoes, since its use would favour the development of the potato scab fungus.

DOES IT PAY TO LIME.—In most cases the answer is in the affirmative. A vast amount of experimentation has been conducted in order to answer this question—in fact, nearly every experiment station has done more or less work along this line; and it has been conclusively demonstrated that lime judiciously applied is an efficient means for producing large crops at a good margin of profit. It costs about the same to plant, cultivate, and harvest a given area without regard to the size of the crop; and if this can be doubled by the addition of a few barrels of lime to the acre, the relative profit becomes very much greater. Besides, the lime will manifest a good effect for a number of years. In closing, I wish to repeat that the habit of liming may become pernicious when practised merely for the purpose of wresting from the soil its locked-up plant food; but when practised with a careful system of rotation and fertilising, it yields a profitable return.

COTTON-GROWING.

Mr. John Willis sends along to the "Daily Record," Rockhampton, the following cutting from the Melbourne "Argus" of 23rd April, 1912:—

Notwithstanding the comparative failure of both the Federal and Queensland Governments to induce, by bonuses and other means, the Northern farmers to grow cotton, the British Cotton Growing Association is still prepared to discuss another scheme. Last week a letter was received in Melbourne by a gentleman interested in the cotton-growing, in which Mr. W. H. Himbury, manager of the British Cotton Growing Association (15 Cross street, Manchester), writes:—

> Although the council of this association has always considered that self-governing colonies should, if possible, find the necessary funds for growing cotton and other economic products, it is most anxious and willing to develop cotton-growing in any part of the British Empire where the conditions are favourable; and if the Queensland Government has any scheme whereby the co-operation of this association would be beneficial to the advancement of the industry, it will receive careful consideration.

It is understood that important plans for cotton production in the Northern Territory are being matured, and that, as soon as the Director of Agriculture has had time to develop the details, an announcement will be made.

COMPLETE FERTILISERS FOR FARM AND ORCHARD.

By J. C. BRÜNNICH, Chemist to the Department of Agriculture and Stock.

The great advantages gained by using **improved methods of cultivation** in combination with the **application of artificial fertilisers,** in order to increase the productiveness of the soil, are getting gradually more recognised. It is quite self-evident that the best profits will result, if small areas are made to produce heavy crops of high quality. This is achieved by "**intensive cultivation,**" as practised in other countries; but our farmers, on account of land being comparatively cheap, hardly know what such cultivation means.

Even the richest of soil will gradually become impoverished by continued cropping; the crops not only become lighter and of poorer quality, but also much more liable to get diseases. The **plant foods** which are removed by the growing crops **must again be returned** to the soil in one form or another. With judicious application of artificial vertilisers, combined with thorough cultivation and, if possible, with rotation of crops, the fertility of the soil cannot only be maintained, but frequently considerably increased.

No artificial fertiliser will be of any value if it does not supply in **adequate proportion all the necessary plant foods** required by the crops and wanting in the soil. Excess of one plant food cannot make up for the absence or deficiency of another. In this respect grave mistakes have been frequently made, and no end of money was squandered by applying manures which only supply a part of the necessary plant foods and, perhaps, one which was not wanted at all. How often have large amounts of bonemeal been applied without getting any benefits, because Potash or Nitrogen were wanting more than phosphoric acid.

No amount of artificial fertiliser will be of **any value** if the land is not in **good tilth** by thorough cultivation, **well drained**, and the soil contains a sufficient amount of **humus** and **moisture.**

Again, it would be a great mistake to apply a large quantity of fertilisers one year and completely neglect to do so the following year.

Situation, climatic conditions, class of soil, and many other factors will influence plant growth, and will make certain districts more suitable for a special class of crops than others.

The importance of **humus** in the soil is frequently quite overlooked by many farmers and fruitgrowers. Unfortunately, a large number of our soils are deficient in the amount of humus they contain, and the customary methods of cultivation and climatic conditions have a tendency to continually lower the amount, and the soils, therefore, lose that **light friable state** necessary for the successful growth of all crops and for the conservation of moisture.

The amount of humus may be increased by the addition of bulky amounts of vegetable matters, dead leaves, straw, cornstalks, and more

particularly of **stable manure.** But even small amounts of stable manure used in addition to artificial fertilisers have a very beneficial action, and increases the value of the artificial fertiliser, evidently by increasing the bacterial activity in the soil.

Stable manure is, however, generally very scarce, and the most economic way to supply to the soil the necessary humus is by the practice of growing and ploughing in of **green manure crops.** As a rule, vigorous growing leguminous crops—like cowpeas, field peas, Mauritius beans, narico beans, velvet beans, &c.—are to be preferred ; but excellent results are frequently obtained with rape and mustard. The crop has to be chosen according to locality and season.

In orchards **mulching** of the fruit trees with green crops, stable manure, dead leaves, &c., is of particular value.

By growing crops in a **proper rotation,** applying the manures required for each crop, the fertility of soil will be increased and good results obtained.

In the case of many crops which, on account of local conditions, do not allow a rotation of crops—like, for instance, sugar-cane—it is always most profitable to give the land, after a few years of cropping, a complete rest. Instead of leaving the land bare or fallow, it is best to grow plants like pigeon peas, wild indigo, and lantana, which cover and protect the soil, and at the same time enrich the soil in humus and make further amounts of mineral plant foods available, so that after a few years of rest it is again completely renovated and fit to grow heavy crops.

In many of our soils the want of **lime** is very apparent, and is frequently shown by strong **acid reaction of soil** and subsoil. Many plants are very susceptible to soil acidity ; and application of artificial fertilisers, and more particularly such with an acid reaction, is frequently an absolute waste of money, unless the acidity is corrected by a previous application of lime in one form or another. Only in the case of heavy clayey soils the use of **quick lime** or **air-slaked lime** is to be recommended ; for lighter soils **carbonate of lime,** in the form of limestone screenings, and also **sulphate of lime** or gypsum, are to be preferred, and all have to be applied as a topdressing. Particularly after ploughing in heavy crops of green manure, many soils develop a high acidity, and may require liming.

As a rule, soils under cultivation for some years will require **complete fertilisers** in order to obtain good crops and maintain the fertility of the soil. It is of interest to mention that in Hawaii the extremely rich virgin soils, when put under sugar-cane, are manured with heavy dressings of artificial fertilisers from the very start, and consequently a heavy yield is obtained and maintained for years.

Still, the fact must be not overlooked that in many cases complete fertilisers are not always necessary and their use not economic. As an instance the manuring of wheat may be mentioned, which is quite different in Australia than in other countries. Practical experiences, gained in South Australia and Victoria, have shown that even very light dressings of superphosphate give excellent results, frequently even better than an application of complete fertilisers. Unfortunately, this experience is not universal; and already in New South Wales exceptions have been found, and it is quite

likely that our wheat-growers will find more complete fertilisers in certain localities better than superphosphate used by itself. All this is a matter of experience, which cannot be gained in a year or two; and experiments in this direction should be encouraged. No farmer should hesitate to do a little **experimenting** of his own, as it is quite probable that his soil requires a slightly different treatment than his neighbour's land.

The plant foods which are generally supplied by artificial fertilisers are:—

Nitrogen, Potash, and **Phosphoric Acid ;** and, as they may be used in various forms, a few remarks on these points are necessary. It must be also borne in mind that the plants can only absorb, by the aid of the roots, such **mineral plant foods** which are actually in solution; and, therefore, **sufficient moisture** must be present in the soil, and the plant foods in the manure should be in a fairly **soluble form.** It is always best to use artificial fertilisers in the most concentrated form, in order to save freight and handling; and therefore, only such will be used in the manure formulæ recommended for the different crops. The **composition** of all **artificial fertilisers** on the market are published from time to time in the "Queensland Agricultural Journal."

Nitrogen is one of the most important and, at the same time, most expensive ingredient of artificial fertilisers.

Nitrogen promotes and stimulates the growth of leaves and stem. but rather retards, on account of a more luxuriant growth, the development of buds and flowers. The leaves generally show a deep-green colour, and the whole plant becomes more vigorous after application of a nitrogenous manure. In the form of **nitrates** it is most active and most readily available to plant life, and is generally applied in the form of **nitrate of soda,** or **Chili saltpetre,** which contains from 15½ to 16 per cent. of nitrogen. Saltpetre is, however, very soluble and, unless directly used up by the plant, may be readily leached out and lost in the drainage water. At the present day it is being replaced by the artificial product **nitrate of lime**, which is just as active and available, but not so easily leached out, and has a much better action on the soil on account of the large amount of lime it contains. Both fertilisers absorb moisture from the air, are not suitable to mix with other fertilisers, and are also bad to handle. They are generally applied as top-dressings in repeated small amounts at the time when the crop is ready to utilise them.

Nitrolim, or **cyanamide,** is another artificial product, containing about 18 to 19 per cent. of nitrogen and over 60 per cent. of lime. The nitrogen is not quite so readily available as in nitrate of lime, but it comes very close in its action and has other advantages. It may be readily mixed with other fertilisers, and may be applied some time before planting. When using this fertiliser by itself, it is best to mix it with about twice its weight of fine soil, to apply the mixture in drills or broadcast it, and cover well with soil, by subsequent harrowing or cultivating, a week or two before sowing or planting the crop. When mixing nitrolim, in the preparation of complete fertilisers, with superphosphate, it is advisable to sprinkle from time to time with a little water during the mixing, in order to keep down the heat produced by a chemical interaction, and to add the potassium sulphate last.

In most of the manuring formulæ, this nitrogenous manure is used, but it may be replaced if desired by the same amount of ammonium-sulphate, or increased amounts of dried blood.

Dried blood contains from 12 to 13 per cent. of nitrogen in a fairly available form, and many crops seem to benefit particularly by this nitrogenous manure, which, however, is rather scarce and not easily obtainable. Blood may be mixed with other fertilisers, and can be applied some time before planting.

Sulphate of ammonia contains about 20½ per cent. of nitrogen in a very soluble form, which, although being so soluble, is not easily leached from the soil, and becomes gradually changed into the active form of nitrate by the action of bacteria. It can be mixed with other artificial fertilisers, except those which contain free lime.

Other sources of nitrogen are fish manure, cotton-seed meal, oil cakes, meatworks manure, &c.

An **excessive application** of nitrogenous manure may act sometimes in a detrimental manner by producing a too luxuriant growth of foliage and tops. and reducing the yield of grain, fruit, or tubers. Such bad effects are counteracted by the addition of fertilisers containing potash and phosphoric acid.

Potash is an important constituent of all plants, and is found most abundantly in the young leaves and twigs, as it is intimately connected with the production of starch and sugar in the leaves and the subsequent transference of these bodies to fruit, tubers, &c.

Many of our soils are rather deficient in potash, and the mineral plant food is, therefore, of particular importance to farmers.

Sulphate of potash, or potassium sulphate, is the most concentrated form in which potassium is used as a fertiliser, as the salt contains about 50 per cent. of potash, in a very soluble and readily available form. This salt is easily handled, and can be mixed with all fertilisers, and can be applied at any time.

In the case of a few crops other commercial forms of potash manure—viz., **muriate of potash,** which contains from 50 to 60 per cent. of potash, and **kainit,** which contains an average of 12½ per cent. of potash—can be used with advantage instead of sulphate of potash.

Wood ashes—particularly the ash of lantana, tobacco leaves and stalks, coffee berry pulp—contain a fairly large amount of potash.

Phosphoric acid is the third important constituent of artificial fertilisers, and found therein in the form of its salts, called **phosphates.** Phosphoric acid appears necessary to the general nutrition of all plants, and hastens their maturity. No plant could produce seeds without a sufficient supply of phosphoric acid. It also aids in the assimilation of other compounds, and aids in the production and transport of the nitrogenous compounds in plant cells.

Practically, the majority of our soils are deficient in phosphoric acid, and more particularly the red volcanic soils are deficient in the readily available soluble form of phosphates, although the total amount present may be fairly high.

Phosphoric acid in the form of **Phosphate of Lime** is the principal constituent of the bones and teeth of animals; and bones, in one form or

another, therefore, form the chief supply of phosphoric acid in artificial fertilisers.

Superphosphates, obtained by treating either bones phosphates or mineral phosphates with strong sulphuric acid, contain from 17 to 19 per cent. of water soluble phosphoric acid, and in a special form of concentrated superphosphate up to 40 per cent.

When applied to the soil, the water soluble form of phosphoric acid will gradually change into a less soluble form, and this change is fairly rapid in our red soils rich in iron.

For soils inclined to be acid, superphosphates are not so suitable, and the phosphoric acid is generally supplied in form of **basic slag,** or **Thomas' phosphate,** which contains the phosphoric acid in a form insoluble in water, but readily soluble in weak organic acids like citric acid.

Bonemeal, or **bonedust,** contains from 20 to 25 per cent. of phosphoric acid in form of lime phosphate insoluble in water or weak acids, which, therefore, becomes available very slowly. Bonemeal generally contains from 3 to 5 per cent. of nitrogen, which makes this manure more valuable.

When studying the **requirements** of **fertilisers** of any crop, the nature of the soil has to be taken carefully into account. There may be a sufficiency of total plant foods, as disclosed by the ordinary agricultural chemical analysis of the soil, but they may be in a **very unavailable** form. Again, small quantities of plant foods, which may be quite sufficient for the crop in a light friable sandy soil which promotes a prolific root growth, may be quite insufficient in a heavy clayey soil.

In preparing the following list of **complete fertilisers** for the most important crops, an **average quality of soil** is assumed ; and it is quite possible that a slight variation in the formula, like reducing one or the other of the ingredients or increasing one or the other, may give better results.

On account of the reasons already mentioned, an excess of nitrogen in artificial fertilisers must be avoided—an excess of phosphoric acid or potash is not likely to do any harm.

In several cases different formulæ are given for one crop, and only a practical test can decide which one of the fertilising mixtures is to be prepared; it may be also advisable and beneficial to apply sometimes the alternative fertiliser for a change.

As a general rule, it is much better to divide the total amount of fertiliser necessary or recommended for the crop into **two** or **more dressings** during the growth of the crop. For all **citrus fruit trees,** and generally **tropical fruits,** a dressing with artificial fertiliser during the winter months—say July to September—and towards the end of summer—about February—will be found most beneficial.

For **deciduous fruit trees** an application of a quick-acting artificial fertiliser before they begin to bloom is sufficient; but all slow-acting manures like stable manure, &c., should be applied in autumn or early winter.

When a very quick-acting fertiliser is applied, it is generally better to supply at the same time some slow-acting one, so as to keep the tree well fed throughout the growing season.

Most **farm crops,** and particularly **vegetables,** which are, as a rule, gross feeders, will benefit by two or more dressings of artificial fertilisers.

Instead of using the mixture of concentrated artificial fertilisers given for each crop, the farmer or fruit-grower can purchase **ready-mixed fertilisers,** which are prepared by several firms dealing in artificial fertilisers.

For the application of artificial fertilisers calm and cool days should be selected, and the application made, if possible, just before or after rain.

Heavy applications of chemical manures should never come into direct contact with the roots of plants, but should be well mixed with the soil.

In order to make the information about manuring more complete, a few remarks on the **class of soil,** most **suitable** to some of the crops, are added :—

ALMONDS.

The free sandy loam of our coastal tablelands is particularly suited, if situations protected from late frosts and strong winds are selected.

Apply to the tree, of medium size, before coming into bloom, a mixture of—

2 lb. superphosphate
1 lb. sulphate of potash
1 lb. nitrolim
} per tree.

APPLES.

Apple trees prefer a fairly rich sandy loam, and also do well on the coarse sandy granitic soil of our coastal tablelands, in the Southern portions in which the winter temperature is low enough to give the trees a complete rest during the winter months. Our orchard soils are generally fairly rich in potash, but rather deficient in phosphoric acid, nitrogen, and humus ; and mulching of the trees is of the utmost importance.

A good fertiliser for apple trees, grown on our sandy soils of average quality, would be—

1½ lb. bonemeal
1½ lb. superphosphate
1 lb. sulphate of potash
1 lb. nitrolim
} per tree.

This quantity is for young trees; for large trees over eight years old the quantity can be about doubled.

Another formula is—

4 lb. meatworks manure
1 lb. sulphate of potash
½ lb. sulphate of ammonia
} per tree.

Several dealers in artificial fertilisers are preparing complete mixtures, suitable for fruit trees, containing from 10 to 14 oz. water soluble phosphoric acid, 3 to 4 oz. of nitrogen, and from 5 to 7 per cent. of potash, which can be applied in quantities from 5 to 10 lb. per tree, according to its size.

APRICOTS.

This fruit tree requires a fairly rich, well-drained, sandy loam, and does very well on our coastal downs country.

A tree in full bearing requires an annual application of—

$$\left.\begin{array}{l}\text{3 lb. superphosphate}\\ 1\tfrac{1}{2}\text{ lb. sulphate of potash}\\ \text{1 lb. nitrolim}\end{array}\right\}\text{per tree.}$$

Young trees can be started with one quarter of this amount, gradually increasing the quantity from year to year until the above amount is reached. For very old big trees, grown on poorer soil, the quantity may be safely increased to 7 or 8 lb. per tree.

ASPARAGUS.

This plant requires a friable, well-trenched loam, rich in humus.

Heavy dressings of well-rotted stable manure, half-decayed leaves and straw, bones, &c., should be well incorporated with the soil.

The value of the stable manure is greatly increased by the addition of—

$$\left.\begin{array}{l}2\tfrac{1}{2}\text{ cwt. bonemeal}\\ 2\tfrac{1}{2}\text{ cwt. superphosphate}\\ \text{1 cwt. sulphate of potash}\\ \text{2 cwt. nitrolim}\end{array}\right\}\text{per acre.}$$

or the same quantities in pounds—viz.,

2½ lb. each bonemeal and superphosphate ;
1 lb. sulphate of potash ; and
2 lb. nitrolim

for every 43 square yards of ground.

A good sprinkling with common salt when preparing the bed gives often good results.

When the shoots begin to appear, a dressing with 1 cwt. of nitrate of lime per acre, or 1 lb. per 43 square yards, can be applied to great advantage.

Asparagus is one of the few plants which likes chlorine (a constituent of common salt and of muriatic acid) ; and, therefore, in the above formula 1 cwt. of muriate of potash may be used instead of the sulphate.

BANANA.

Bananas require a deep well-drained scrub soil or rich alluvial loam, in sheltered position, free from frost, near the coast. The soil must contain a large amount of humus. The humus content of the soil must be kept up by mulching with green-manure crop, leaf mould, stable manure, &c.; and any acidity in the soil must be overcome by liming with lime, in form of carbonate of lime, as limestone, shell sand, limestone screenings, &c.

Even on exhausted soil, as long as the soil is in good physical condition and contains humus, bananas may be successfully grown by the aid of artificial fertilisers, applying from 5 lb. to 7 lb. of complete mixed fertiliser to each stool twice a year.

The following manure mixtures will be found beneficial, and will pay the grower by better returns of large bunches :—

Superphosphate, 3 to 4 cwt.
Sulphate of potash, 2 to 3 cwt. } per acre ;
Nitrate of lime, 2 to 3 cwt.

higher or lower amount according to age and quality of soil ;

or,

Superphosphate, $1\frac{1}{2}$ cwt.
Bonemeal, $1\frac{1}{2}$ cwt.
Sulphate of potash, 2 cwt. } per acre ;
Nitrolim, 2 cwt.

or,

Superphosphate, 3 cwt.
Sulphate of potash, 2 cwt. } per acre.
Dried blood, 2 cwt.

The artificial manure to be applied in two dressings—one towards the end of summer, at the end of rainy season ; and the other at the end of winter. Some soils contain a very small amount of salt, and in that case bananas will benefit by a slight dressing of common salt.

BARLEY.

This cereal prefers an open and free sandy loam. Barley is a valuable food for stock ; but it is also grown for malting purposes, and in that case an excess of quick-acting nitrogenous manure, like stable manure, nitrate of soda, &c., must be carefully avoided.

A complete fertiliser for malting barley is the following :—

Superphosphate, $1\frac{1}{2}$ to $2\frac{1}{2}$ cwt.
Sulphate of potash, $\frac{3}{4}$ to 1 cwt. } per acre.
Dried blood, $\frac{3}{4}$ to 1 cwt.

For barley grown as cattle food apply—

Superphosphate, 2 to 3 cwt.
Sulphate of potash, 1 cwt. } per acre ;
Nitrolim, 1 cwt.

one-half to be applied when sowing, and half as top dressing.

BEANS.

Beans grow well on almost any soil, but prefer a well-drained clayey loam. Like all leguminous crops, beans require lime, and the soil should contain a fair amount of this plant food. Apply per acre, according to the quality of soil—

2 to 3 cwt. of superphosphate ;

$\frac{3}{4}$ to $1\frac{1}{2}$ cwt. of sulphate of potash ;

None to $\frac{1}{2}$ cwt. of nitrolim (or dried blood).

When the beans are grown to be eaten green, the amount of nitrogenous manure can be considerably increased by using 1 cwt. of nitrate of lime, applied in three or four portions as topdressing.

For use in garden, apply—

6 lb. superphosphate,

2 lb. sulphate of potash,

$\frac{1}{2}$ lb. nitrolim,

and 3 topdressings of $\frac{1}{2}$-lb. of nitrate of lime to every 43 square yards.

[TO BE CONTINUED.]

A SHEEP FARMER'S SILO.

By W. G. BROWN, Sheep and Wool Expert.

The Federal Statistician recently issued a list of the number of holdings in the Commonwealth where ensilage is produced. Among these Queensland is easily lowest with a total of ninety-seven silos.

It has been said a thousand times that Australia is fortunate in not having to provide (like our cousins the Canadians, for instance) artificial fodder for stock for five or six months in every year. Perhaps it is not so certain that we are fortunate. A few set-backs may teach us wisdom. For a decade, with one or two comparatively lean years, there have been most bounteous seasons; yet now that the inevitable drought is upon us, we are worse off than ever before, in possessing no reserve stocks of fodder, and tales of distress are being published daily, with the whole winter before us, and a strong probability of little or no rain before the spring. *Annual* dry spells might have forced us to conserve fodder.*

The best stock authorities of Australia are preaching ensilage—ensilage—ensilage—every time. Exhaustive experiments have been conducted in New South Wales for some years, and the results published. Amongst other interesting facts recorded, it has been shown that, for fattening purposes, ensilage is quite as good as green grass—that while hay alone causes serious losses in breeding ewes or cows when their time is come, ensilage is as good as natural pasture; that it is the cheapest fodder known, and the least liable to destruction or deterioration.

In regard to its use by sheep farmers especially, the Agricultural Department of New South Wales published the following *re* cost of feeding on ensilage made from natural growths:—

"While there is any dry feed about, a ration of 1 lb. per day will be quite sufficient for sheep; but, as the dry feed disappears, it will be advisable to gradually increase the ration to 3 lb. per day. At these rates 1 ton of silage will give a daily ration of 1 lb. to 2,000 sheep, allowing a fair margin for possible but not probable waste, while 3 tons will give a full daily ration; the cost for silage being 2s. and 6s. per day respectively at the pit, which is surely a small sum, and particularly so when it is remembered that, in drought time, if chaff or hay can be obtained at all, £8 per ton is considered very reasonable, and that dry feed is not nearly so suitable either for breeding ewes or milch cows as silage. In fact, once green feed has disappeared, there is nothing within reach of the sheep farmer which approaches silage as a cheap and satisfactory food for sheep. It may be as well to emphasise the fact that this silage is made from natural growths—viz., herbage, thistles, &c.—unaided by irrigation or any artificial means."

Thus the Agricultural Department of New South Wales. Coming to our own State, I witnessed the erection and filling of a silo, which proved to be perfectly effective, on Mr. E. Graham's holding, Manapouri, on Pilton Estate, Greenmount. This silo cost, material and

* The short season of drought terminated in June last.

labour included, £9 18s., and the 64 tons of ensilage put into it cost slightly over 4s. 6d. per ton. Mr. Graham is a feeder of sheep, hence the interest to other sheep farmers of his operations, which I proceed to give in detail.

Most silos cost at least £1 for every ton capacity, and require skilled labour and expensive materials. It is doubtful if the regulation silo can be built on the Downs, under present conditions, at less than 25s. per ton capacity.

The crop was maize, sown broadcast on 8 acres. Owing to the dry time, it was plain to the manager that it would come to nothing as far as grain was concerned. It was comparatively stunted; in some places not more than 3 ft. high, and the rest not higher than 6 ft. It was light in the stalk, and only sparsely furnished with immature cobs. A 6-h.p. steam engine was hired, and also a cutter and blower of American make. The cost of erecting the silo as furnished by Mr. F. Reams (Mr. Graham's manager) was as follows:—

MATERIALS AND LABOUR.	£	s.	d.
10 Poles, 19 ft. long, 8 in. at big end, at 10s. each ..	5	0	0
10 Fencing posts, 6 ft. 6 in. long, at 6d. each	0	5	0
230 Feet, wire netting	1	10	0
Fencing wire, bolts, and sundries	0	10	0
Labour of 3 men for 2 days, at 5s. per day, with board and lodging	2	8	0
	£9	13	0

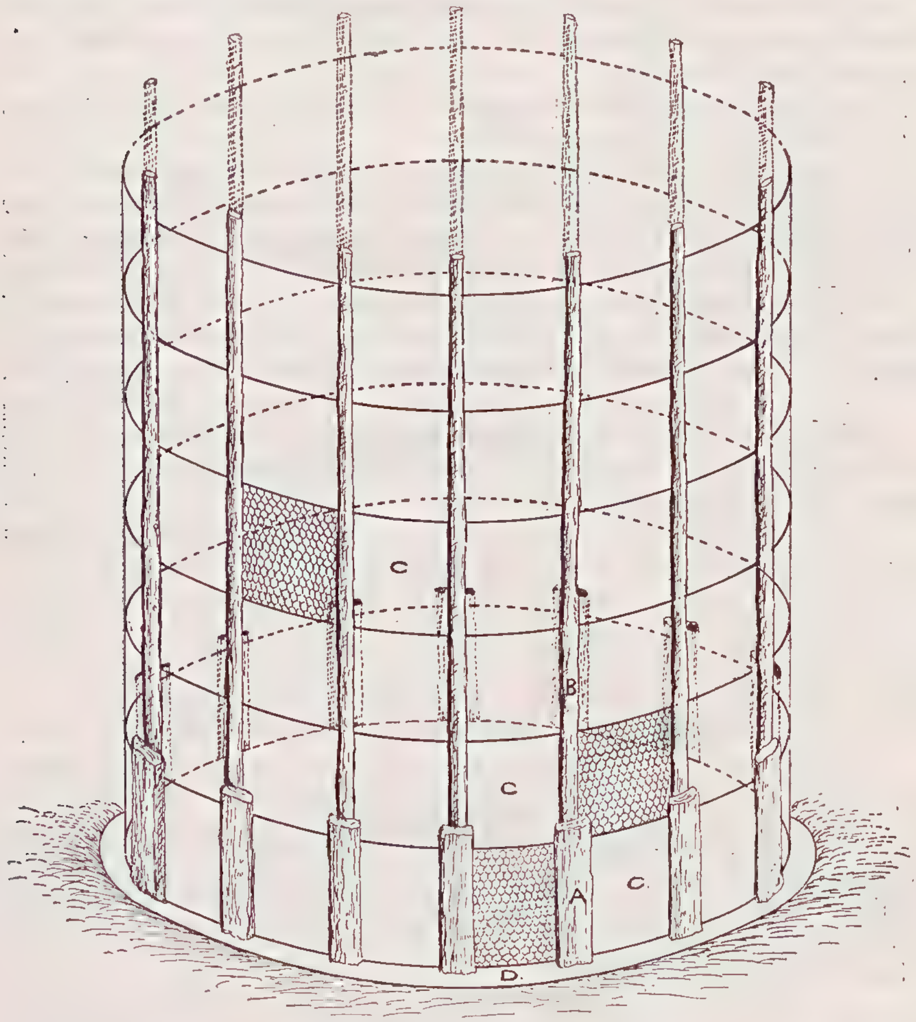
COST OF MAKING ENSILAGE.	£	s.	d.
8 Men for 3 days, at 5s. per day	6	0	0
1 Engine driver, 3 days at 10s. per day	1	10	0
Wood for engine, 1 cord at 7s. 6d.	0	7	6
Food for 8 men, at 14s. per week, for 3 days	2	8	0
Hire of engine, 3 days, at 10s. per day	1	10	0
Hire of blower and cutter, at 10s. per day	1	10	0
Binder twine	0	2	0
Sundries not enumerated	1	0	0
	£14	7	6

When the last sheaf was cut and blown into the silo, it was estimated that not less than 64 tons of ensilage had been manufactured.

The cost, therefore, of making 64 tons of ensilage, works out at about 4s. 6d. per ton. Truly a cheap food for stock if 4 lb. be a full ration for a ewe and lamb.

METHOD OF BUILDING.

A circle was made 18 ft. in diameter, and at regular distances ten holes were sunk in the earth to a depth of 3 ft. In these holes the fencing posts were placed, and well tamped in. The 19-ft. poles were then placed beside the posts, about 6 in. in the ground, and on the inside, facing the centre of the circle. They were firmly fastened to the posts by ½-in. bolts, two to each pole. Then, at distances of about 3 ft. apart, holes were bored in the poles, and ordinary black fencing wire drawn through. Then the wire netting was attached to the poles on the inside, as high up as was deemed necessary for the estimated amount of available crop. The appearance of the silo when finished, shown in a crude way, was as below:—



An ordinary reaper and binder was used, and it was found that, instead of two wagons sufficing to keep the field clear, the machine, excepting when it broke down on one occasion, was always ahead of the wagons.

Similarly, the machine could not get enough material to work at full capacity. Two wagons extra would be required to keep up a full supply of maize. Only straw was placed on the earth, and the blower was placed at its greatest extension, and was not shifted at all afterwards. A drain was dug around the silo after it was filled.

For roofing purposes, about 1 ton of weeds and rubbish was chaffed up very small and blown on to the top of the silo stack (the centre of which was raised) to a depth of about 4 in. over all. On top of the chaff was placed about 1 ton of long firewood set with ends at the centre and circumference of the ensilage. Any person whatever can build a simple affair such as this, and, if he keep sheep, will be able to smile at a dry time. Ten acres of maize, grown in a good time and put into such a silo, means quite 150 tons of ensilage, and 150 tons of ensilage will keep at least 600 sheep for 150 days at a cost of less than £40, inclusive of cultivation.

Several keen practical farmers who came over to see this silo were enthusiastic as to its possibilities.

Of course, the method as compared with the more permanent silos is somewhat crude, yet these cheap silos may be improved upon without any serious addition to cost. For instance, after a few feet had been chaffed into the silo, Mr. Reams thought that it would be an advantage to put something on the wire netting to keep out air. He caused a number of stalks of maize to be interlaced, and the result was that an almost air-tight surface is presented wherever that method was applied.

For the coming lamb-raising business on the Downs, it will be necessary to keep the ewe and lamb without a check. With this cheap and handy method there can be no excuse for a man having to "hold over" his lambs through a bad time.

Messrs. Graham and Reams are to be congratulated upon their wisdom and enterprise in showing the way.

CLEARING LAND WITH DYNAMITE.

Mr. R. B. Howard, Chief Protector of Aboriginals, writes as follows on the subject of "Clearing Land with Dynamite":—

For some years I have been using dynamite on my farm for purposes of clearing the land of timber, for subsoiling, and also for draining. Thinking perhaps a description of the methods employed may interest some of your readers, I am now sending a few notes which you may deem desirable to publish:—

In clearing land of stumps or trees, a charge of dynamite is placed *under*, not *in*, the stump, by boring a hole with a 1¼-in. shell auger on three sides of the tree or stump to be operated upon. The holes are bored at an angle of, say, 45 degrees, with the object of bringing the bottom of the holes as closely together as possible, the depth of each hole being about 3 ft. The size of the stump will regulate the charge.

For a stump of 18 in. in diameter I would use four cartridges in each hole—that is, twelve altogether. When charging, I always split the paper wrapper of the cartridge on two sides, and place *one* cartridge at a time into the hole, carefully squeezing down with a wooden rammer. Only *one* cartridge is primed with detonator and fuse. This cartridge is, of course, *not cut*. When the holes have been charged and tamped, the fuse is fired, and the concussion in one hole has been found sufficient to explode the others. It will, of course, be understood that the bottom of the holes must not be more than, say, 8 or 10 in. apart.

This method of clearing land I have found a good deal more preferable and less costly than pulling stumps or trees with a machine, and I estimate you can blow up fifty stumps in the time it would take to remove one or two under other methods.

The effect of the dynamite is to split up the stump, remove all soil sticking to the roots, break all the main roots, and loosen the soil for yards around; and the stump burns readily. Moreover, *one* man can do all the work.

In the ordinary cultivation work I have found dynamite most useful in almost every class of soil, but more especially where a substratum of clay is in evidence. By drilling or boring with an auger holes 20 ft. apart to a depth of 3 ft., and charging each hole with three plugs of dynamite, it will be found, after explosion, that the subsoil is fractured, for a radius of not less than 10 ft. from each hole, to a depth of about 4 ft. It would be quite superfluous for me to point out to the agriculturist the value of such an effect on the soil.

Again, where an orchard shows signs of decay, which is often the case with citrus orchards, the effect of dynamite blasting gives marvellous results, the trees in a very short time regaining their vigour and showing luxurious growth.

In fact, from the experience I have gained in using dynamite, I am strongly of the opinion that, were its value as an adjunct to farming more generally known, it would come into general use. The cost compared with other methods has also to be considered; and when it is pointed out that 1 acre of land can be efficiently subsoiled—more so than by any other means—for a sum less than £5, the value of the operation is apparent.

In my own case I have just treated about 2 acres of land in which ornamental trees had been planted, but, although about three years old, the growth was stunted and altogether unsatisfactory, owing to a cold impervious white clay underlying the few inches of top soil; and I am satisfied these trees will now make a good growth. Again, I have also treated my orchard in a similar way, and the result has already been very satisfactory.

The general opinion appears to be that dynamite is exceedingly dangerous to handle. Well, Mr. Editor, so is a gun if placed in the hands of a careless person. My sons and myself handle dynamite constantly without the slightest fear of an accident; and, if the same care is exercised as would be in the case of a loaded firearm, there is

little or no danger—in fact, a pea rifle in the hands of a young lad is far more dangerous than a ton of dynamite under the care of a responsible person.

I shall be glad to afford any information in my power to anyone inquiring as to the use of this explosive in farming operations.

SWEET POTATOES.

By G. B. BROOKS, Instructor in Agriculture.

In my travels throughout the State, more especially in districts where settlers new to Queensland conditions are commencing operations, I have had numerous inquiries relative to the raising of the sweet potato. This short article is mainly intended to supply information to those newcomers who are entirely unfamiliar with this crop, and the methods to be observed in the growing of such.

Why this crop has not received more consideration from the hands of a Queensland farmer is somewhat of a mystery, for when we come to compare the two crops we find that the sweet potato has many apparent advantages over its English compeer. Grown, as it is, during the season of the year when moisture is most abundant, it is invariably a sure cropper, which cannot be said of the English variety, and gives at least five times the return per acre. It is less liable to disease, and has also a higher food value.

It provides excellent food material for all kinds of stock—pigs, cows, horses, fowls—and in the hands of a good cook can well be classed as a table delicacy.

The high price ruling and likely to continue for English potatoes, should also be the means of bringing this crop into a more prominent position as a product of the farm.

It is usual to preface an article on any plant or crop by a short history of its origin and introduction, &c. This I am to discard, and in its place insert the following paragraph, taken from an early issue of the "Queensland Agricultural Journal," and which I think will be of more interest to the farming community:—

"A RECORD CROP AT ST. HELENA.

"In the year 1888 a crop of sweet potatoes was harvested at St. Helena, which we believe has not yet been equalled there or elsewhere. The soil of the island is red volcanic, rich enough to require no manure. Twelve acres were planted with sweet potatoes, on 6 acres of which the yield was 35 tons of saleable potatoes per acre; 155 tons 9 cwt. were sold for cash at an average price of £4 15s. per ton, some fetching £6 10s. per ton. Over 38 tons were used for domestic purposes, and the balance was fed to stock. The largest potato weighed 34 lb. The variety grown was the Maltese, and they were planted on ridges 3 ft. apart. The season was very favourable as regards rainfall, and the high price obtained was attributable to the partial failure of the English potato

crop. The total value of the crop sold was £919 2s. 6d. If the produce of the 6 acres had been sold at the higher price—viz., £6 10s. per ton—the return for the 210 tons would have reached £1,365."

The yield mentioned in the above is by no means extraordinary. The writer has found, from experience gained in growing this crop, under the varying conditions obtaining in North, Central, and Southern Queensland, that, by giving attention to details in regard to cultivation and planting, very heavy yields can be secured even in situations considered by many growers entirely unsuitable for the sweet potato. What, then, are the conditions that govern the successful growing of this crop? The first point to be considered is—

CLIMATE.

The sweet potato undoubtedly favours a rather warm moist climate. Conditions suitable for the growth of maize are equally suitable for the sweet potato. It can also be grown in hot dry districts, providing the land has been worked, so as to conserve the maximum amount of moisture. Being very susceptible to frost, it is essentially a summer crop.

SOIL.

Sweet potatoes can be successfully grown in practically any soil suitable for ordinary cultivation. The impression held by many, that this crop can only be grown on a sandy loam, is erroneous—in fact, the heaviest crop raised by the writer was on a very stiff basaltic clay, which gave a little over 50 tons per acre. The reason why a sandy loam generally gives best results is that more liberties can be taken with this class of soil, in regard to cultivation, than with one of a heavy or more tenacious nature. This fact must not, however, be lost sight of—viz., that a rich friable loam will invariably give the best returns, a well-drained soil being essential to the production of a good quality tuber. I was recently shown what was locally thought to be something extraordinary—a heavy crop of sweet potatoes growing in a swampy grey clay soil, and where water could be obtained at a less depth than 2 ft. Although the tubers were large, the quality was not the best.

PREPARATION OF THE SOIL.

The land intended for this crop should be broken up at least two months previous to planting, the depth to vary with the quality of the soil. Less than 6 in. is not, however, recommended. A second ploughing should follow, and, in the event of the ground being rough or lumpy, the roller and disc cultivator should be made use of to bring about the necessary tilth.

The question is often put: "Is hilling necessary?" In the majority of cases it is. The exception is in very dry and hot localities and where the soil is loose and friable. In soils that are liable to set hard, hilling is essential to the securing of a heavy yield of well-shaped tubers—the size of the hill is dependent to a large extent upon condition of soil and rainfall.

In coastal districts enjoying a moderately regular rainfall, a 3-ft. hill or ridge is generally sufficient, upon which a single row of cuttings is planted.

In drier localities wider ridges are advocated—3 ft. 6 in. for single row, and 5 ft. for double row.

The 3-ft. ridge can be set up with an ordinary mouldboard plough or single disc, simply by throwing two furrows together. It is important that the furrows should not meet, but that a V-shaped depression should be left on top for the purpose of retaining any rain that falls for the benefit of the young plants. The ridge, to prevent drying out, should also have plenty of "body." The following illustration will demonstrate this point:—

The ridges should be set-up sufficiently early to allow of planting being carried out as soon as sufficient rain has fallen to ensure rooting.

PROPAGATION.

The securing of a heavy yield depends largely upon two factors—viz., the selection of sets from a healthy and prolific variety, and early planting. The common practice of waiting until cuttings are available from the residue of the previous year's crop cannot be too strongly condemned, more especially in cool districts or dry localities, where the growth of vines during early spring is invariably slow. Neglect in the selection and cultivation of the sweet potato very soon leads to degeneration, and, where slipshod methods have been practised, we hear frequent comments about the crop "running out," and that instead of developing tubers thick stringy roots are produced. Cuttings from these decadent vines will invariably produce similar plants. Now the raising or breeding up of a good class of sweet potato is a comparatively simple matter, as the following directions will show:—

A month previous to planting dig a shallow pit or bed, preferably in some sheltered situation—about 1 ft. 6in. deep and 3 ft. across, the length depending upon the number of vines required. Three parts fill this bed with unrotted stable manure, containing a fair proportion of straw to ensure heating. If dry, water slightly; then tread down level. Cover with about 3 in. of sand if available; otherwise sandy or any other soil will do. Allow two days to settle, so as to get rid of ammonia fumes, which would cause rotting. Select the medium-sized tubers from the most prolific vines; place on top of bed, close together, but not touching. Cover to a depth of 10 in. with soil similar to what they are placed on, and water occasionally. A bran bag or two nailed to a couple of saplings will be found very convenient to throw over the bed in the event of frosts being experienced.

It is surprising the very large number of cuttings that can be secured in a very short time from a few square yards. In removing the

shoots for planting, care should be taken to cut close to the ground. By keeping the bed moist, successive cuttings will be available at very short intervals.

By adopting the above method of selection and propagation, the farmer will find that the quality of this crop will be considerably improved, and that there will be no necessity to go to another district for a change.

In connection with plant breeding, it may be mentioned that the introduction of farm seeds, etc., into a district differing in soil and climatic conditions is now generally regarded as a mistake. It is only the careless farmer who benefits by such a change, for in going outside his own district he invariably buys seed of a higher grade and from one who has exercised discretion in regard to selection.

PLANTING OUT.

The time to put the cuttings out may be said to be just as soon as all danger of frost is over and sufficient moisture is present to ensure rooting. In the coastal districts it is generally safe to plant about the beginning of September, and correspondingly later on the western side of the Range according to locality. Planting in December is favoured by many, owing to conditions being favourable for a good "strike" to be followed by luxuriant growth. Unfortunately, luxuriant growth accompanied by heat and moisture has a detrimental effect on the setting of the tubers. From personal experience I have found that early planting, even if followed by a dry spell, is a distinct advantage in that the check during the early period of growth has the effect of inducing the plant to set tubers, and less tendency to run to vine later on.

Cuttings taken from the end of the vines are generally the best. They should be about 9 in. long, and covered to within an inch or so of their total length. Planting with a peg or dibble is not recommended. Scooping out a depression by hand and pressing the soil firmly on the cutting is much better. Sometimes cuttings 12 in. long are used, and both ends left uncovered. Small tubers can be used instead of cuttings, but the results from such are not generally satisfactory.

VARIETIES.

There are a number of varieties under cultivation in Queensland—the most common of which are White Maltese, Rosella, Yellow Spanish, and Spanish Giant. The White Maltese is a general table favourite, produces long tubers, and is a rather late maturing variety. The Spanish varieties, being heavy croppers, are very suitable for pigs and other stock.

AFTER CULTIVATION.

Given favourable climatic conditions, very little after cultivation will be necessary. Any strong growing weeds will require to be kept down with the hoe. The smaller weeds will eventually get choked out with the rapid growth of vines.

HARVESTING.

For table use and market purposes, the harvesting is generally done by hand labour, the tubers after removal of the vines being dug out with a digging fork.

When required in large quantities for pigs, &c., the plough can be used. A deep furrow is first thrown away from the side of the ridge, to be followed by another which turns out the potatoes. The sweet potato is seldom stored, being dug as required. There is little difficulty, however, in keeping the tubers. A cool airy building is necessary, the tubers being spread in layers and covered with dry sand.

PESTS.

This crop has, so far, proved practically free from disease. The borer is, however, prevalent in many of the older districts. This pest bores into the upper portion of the tuber when growing, and when once in the soil it is very hard to eradicate. In new and isolated districts the greatest care should be exercised in the introduction of tubers intended for seed purposes. Should there be any difficulty in the procuring of such, it would be distinctly advisable to propagate this crop by means of cuttings.

TREATMENT OF SEED POTATOES WITH FORMALIN.

A WARNING.

In the "Agricultural Gazette" of New South Wales (says that journal of 2nd May) it has, on several occasions, been recommended that seed potatoes be treated with formalin to prevent the development of scab and other diseases in the crop. This last season the potatoes at Bathurst Experiment Farm, which were treated in this way, were practically a failure, whilst plots of untreated seed germinated well. In the Farmers' Experiment Plots, also, the germination was defective, probably due to the same cause.

It seems clear that, under some conditions, at least, formalin has a bad effect upon the germination of potatoes. Experiments are now being conducted with solutions of different strengths, and other remedies are also being tested. Meanwhile, this warning is issued for the benefit of potato-growers, who are advised to be cautious in using formalin.

IRISH TOBACCO.

Tobacco-growing in Ireland seems (according to the eleventh annual report of the Department of Agriculture) to be going ahead. There are about 135 acres under tobacco, and the prices realised from manufacturers for the output average 5¼d. per lb. In his remarkable book, "The Case Against Home Rule" (128 pages, published by the West Strand Publishing Company at 3d.), Mr. L. S. Amery, M.P., draws attention to tobacco as one of the industries which might be profitably developed, especially under a system of tariff reform which gave Imperial preference. He says Ireland might secure £1,000,000 of the £3,500,000 spent on unmanufactured tobacco.

WATER SUPPLY TO FARMS.

BY ARTHUR MORRY, Surveyor, Department of Agriculture and Stock.

THE COLLECTION AND STORAGE OF RAINFALL.

[CONTINUED.]

Sometimes conditions are such that a good storage reservoir is best obtained by constructing a substantial earthern dam across the gully, and providing a suitable by-wash to conduct the surplus water into the same gully at a point below the dam.

When labour is cheap, this form is generally inexpensive, as little material requires to be purchased. Care must, however, be taken to make it sufficiently strong to resist the pressure and perfectly water-tight, as the smallest leak caused even by a rat hole will gradually extend until the whole dam is destroyed.

The following specification will describe a dam of this character:—

Select the site in such a position that the construction of the dam and by-wash will not seriously divert the gully stream from its original course.

Excavate the surface soil from the whole of the ground to be occupied, and remove it to the outer toe of the bank. When nearing completion, spread this evenly over the outer face of the embankment, so as to form a slope of 2 to 1.

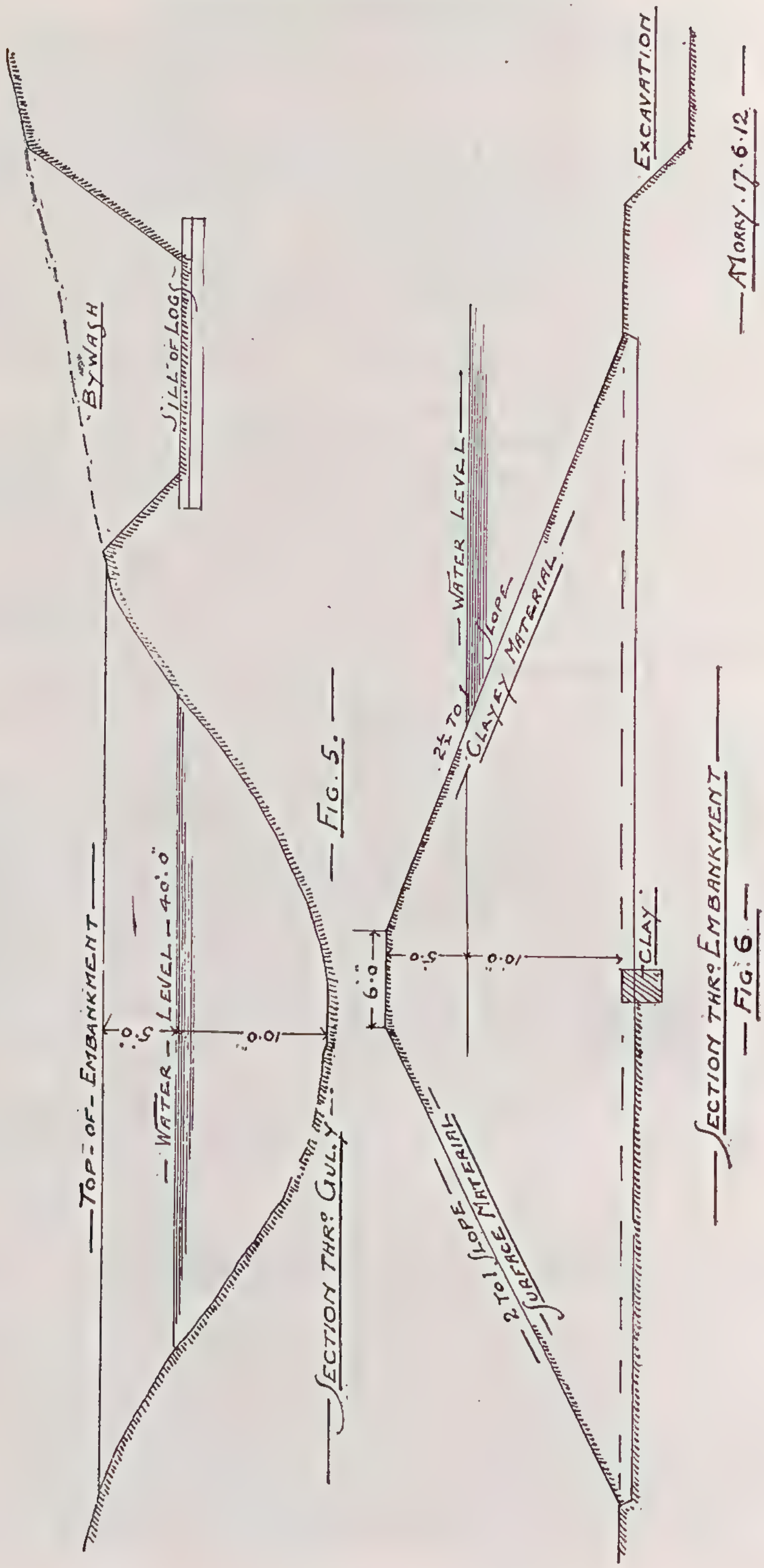
Excavate a trench 2 ft. deep and 2 ft. wide right across the gully and into the bank on each side, and fill this with well-puddled clay placed in 12-in. layers and well rammed.

Excavate the bed of the gully as shown on Fig. 6, in order to obtain material for forming the embankment; that taken from near the surface to be deposited on the outer portion; the other material, which is generally of a more clayey character, to be deposited on the inner portion, forming a slope of 2½ to 1. As far as possible, the embankment should be formed in layers 12 in. in thickness, each layer being consolidated by ramming or other means; the crest to be not less than 6 ft. in width, and to be carried up to a height of 5 ft. above the full-supply water level; to be well consolidated by passing traffic over it during construction.

Excavate for the by-wash as shown on Fig. 5, on the side most suitable for the purpose, and of sufficient width to ensure the passage of all surplus water when the dam is full. This width can only be determined by the extent of the catchment area and the quantity of water likely to pass over. Should it be too small, the water during storms will find its way over the top of the embankment and gradually wash it away.

The bed of the by-wash should be excavated to a grade of 1 in 200, with heavy logs across same, placed close together for the first 5 or 6 ft., thus forming a sill; and a sill piece of several logs placed on the top and by the side of each other across the by-wash, opposite the crest of the dam, the top log to be the same level as the full-water supply.

If clay is available, the whole of the inner face of the embankment should have a layer of 6 to 12 in., evenly spread and well rammed in position.



Section Thro' Gully.—Fig. 5.

Section Thro' Embankment.—Fig. 6.

When clay is not available, a core of galvanised corrugated iron may be effectively used by jointing the sheets horizontally and vertically with strips of bituminous material or rubber insertion, bolting together tightly, and protecting, as already described, with several coats of pure cement wash. The sheets should be extended some distance into the banks on each side, and the earth rammed tightly against same. In all probability long before these sheets will have corroded the ground will have become so thoroughly consolidated as to be perfectly watertight.

In a case of this kind, quantities can only be used for comparative purposes; but, as a guide to those interested, an approximation is here given based on an assumed width of 40 ft. and a height of 10 ft. at water level when full. By this the reader will be able to form a rough idea of the cost of any similar work he may contemplate, bearing in mind the fact that cost of labour varies in different districts.

The embankment will contain about 650 cubic yards of earth, all of which must be excavated, deposited, and well rammed in position. The cost of this will depend entirely on the nature of the ground, and will vary from 1s. to 2s. per cubic yard

Hill-side dams and underground tanks will be next dealt with.

[TO BE CONTINUED.]

MANURING OF POTATOES.

It is contended by the British Department of Agriculture that a proper system of manuring is an important factor in keeping down blight, and to this end report the results of recent experiments. The best results were obtained from a combination of farmyard manure and artificials. A light dressing of farmyard manure, with a suitable dressing of artificial manures, is found the best; and for general application the following is recommended:—

Farmyard manure, 10 tons.
Sulphate of ammonia, 1½ cwt.
Superphosphate (30 per cent. soluble), 4 cwt.
Muriate of potash (50 per cent. potash), 1½ cwt.
Costing about 48s. per acre for the artificials.

For the guidance of farmers who might prefer to buy the mixture ready prepared from a manure merchant, it may be mentioned that it would yield the following analysis, which should be guaranteed:—

Ammonia, 5 per cent.
Soluble phosphate of lime, 17 per cent.
Potash (pure), 16 per cent., and cost about £7 per ton.

If it is not convenient to a grower to supply a dressing of farmyard manure, then he can get satisfactory crops by the use of artificials alone; but this course cannot usually be recommended unless the land is well-stored with humus, as in the black soils or in those soils which have been liberally treated with farmyard manure in previous years.

If artificials alone are used, the following mixture is recommended:—

Sulphate of ammonia, 2½ cwt.
Superphosphate (30 per cent. soluble), 6 cwt.
Muriate of potash, 2¼ cwt. per acre.

This mixture of 10¾ cwt. per acre would yield:—

6 per cent. of ammonia;
17 per cent. soluble phosphate;
10 per cent. pure potash;

and, if supplied by a manure merchant, ready mixed, should cost about £8 per ton.

The Departmental committee suggests that the artificials should be broadcasted across the drills before the potatoes are set. When the mixing is done on the farm, the operation should take place immediately before the fertiliser is required for sowing.

These mixtures contain a very ample supply of potash, and on rich soils, especially when farmyard manure is applied, the potash might be reduced by one-third without prejudice to the crops.

NEGLECTED INDUSTRIES.

CHICORY.

Most people are aware that large quantities of chicory are used for mixing with coffee, and the generality of European, American, and Australian coffee-drinkers prefer the flavour of "chicoried" coffee to the pure ground coffee. The chicory plant, although it grows well in tropical Queensland, is not an exclusively tropical production. In its wild state it has a very wide range, and in Europe and Asia this is only limited by the Arctic regions and, as was formerly believed, by the tropics; but we have ourselves seen chicory growing luxuriantly near Hambledon, in the tropical district of Cairns, where chicory was also prepared for market.

The chicory plant is a hardy perennial, bearing beautiful blue flowers on a stem often 5 ft. high. The land for this crop should be got ready in August, and during that month the seed is sown in drills about 2 ft. apart, sometimes only 16 in. apart in Europe. When the young plants appear, should they be attacked by slugs or snails, which are very partial to the succulent young leaves, the usual remedy in the shape of spraying is adopted. Before the leaves cover the ground, the plants must be thinned out, and those removed may be transplanted. Then the intervals between the rows must be kept clear of weeds either by forking or by the use of a scarifier. The value of the plant lies in its root, although the young leaves are largely used in France, Belgium, and other Continental countries as salad. The plant has a thick, white, fleshy taproot, and thrives in any soil which will suit carrots, parsnips,

arrowroot, cassava, &c. The roots come to maturity in from five to six months, and are then ready to be taken up and dried.

In England the weight of the crop ranges from 3 to 5 tons per acre, but the American reports give 15 tons per acre as an average. Certainly such a crop has not been obtained in Australia; so the yield must be taken as a mistake or as an exaggeration. There are several varieties of chicory, the best being called "whitloof," meaning "white leaf," which forms a head very similar to that of the Cos lettuce. It is also called the "large-rooted brussels" chicory, from its thick, stubby root. The young roots may be boiled and eaten like parsnips. The leaves form excellent fodder for cattle and sheep.

The chief commercial use of chicory is in the form of the dried, roasted, and powdered root as a substitute for or as an adulterant of coffee.

To prepare it for this purpose, the root is first cut into small pieces, dried in a kiln, and then roasted in revolving iron cylinders. In North Queensland, or even in the South, the sliced roots may be perfectly dried in the sun. The loss between the weight of the fresh and that of the roasted root is from 25 to 30 per cent. During the roasting, 2 lb. of lard to every cwt. of chicory are added to give it a lustre like that of coffee. The powder looks very like ground coffee, and has a strong odour of liquorice.

There is a market for dried chicory, we believe, in this and in the Southern States of the Commonwealth.

ARTIFICIAL RUBBER.

NO SWORD OF DAMOCLES.

Mr. Gustave van den Kerckhove, the well-known rubber expert, makes some apposite comments in "Bulletin de l'Association des Planteurs de Caoutchouc" for March on the determined efforts of chemists and financiers to secure an artificial rubber. It is a widespread error that these efforts were due to the rubber boom. In the course of the last twenty years, hundreds of samples of artificial caoutchouc have passed through Mr. Kerckhove's hands, and not once has he found the artificial in any way comparable with the natural article. He is prepared to pay homage to the obstinate searchers after the synthetic which shall do what nature does, but, as he points out, they can never give it the life and nerve which belong to the real thing. Planters of rubber-trees need not worry themselves; artificial rubber is not the sword of Damocles, declares Mr. Kerckhove. Despite all that has been attempted in England, Germany, France, the United States, and Belgium, synthetic energy, he says, has only created a mirage: "Artificial rubber seen looming in the distance looks something; when approached it is nothing."—"Rubber World."

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RECORD OF COWS FOR MONTH OF MAY, 1912.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Lerida ...	Ayrshire	4 Mar., 1912	1,016	4·0	45·40	
Redrose ...	Shorthorn... ..	23 Mar. ,,	795	4·2	37·40	
Lady Margaret	Ayrshire	4 May ,,	849	3·9	36·95	
Miss Hayden	Shorthorn... ...	21 Mar. ,,	753	4·0	33·65	
Nellie II. ...	,, ...	1 Feb. ,,	713	4·1	32·69	
Davidina ...	Ayrshire	29 Dec., 1911	734	3·9	31·94	
Lavinia's Pride	,, ...	23 Feb., 1912	674	4·0	29·40	
Glen ...	Shorthorn... ...	30 Sept., 1911	506	4·9	27·97	
Laura ...	Ayrshire	6 Mar., 1912	647	3·8	27·39	
Miss Jean ...	,, ...	10 Apr. ,,	629	3·9	27·37	
Burton's Maid	Shorthorn... ...	2 Feb. ,,	555	4·1	25·45	
Daisy ...	Holstein	2 Feb., 1911	613	3·7	25·23	
Lark ...	Ayrshire	29 Nov. ,,	534	4·2	25·11	
Queen Kate	,, ...	9 Feb., 1912	518	4·2	24·36	
Butter ...	Shorthorn... ...	6 Nov., 1911	506	4·2	23·80	
Lady Morton	,, ...	9 Feb., 1912	527	4·0	23·55	
Miss Lark ...	Ayrshire	17 Jan. ,,	499	4·2	23·47	
Flora XVII.	Jersey	10 Feb. ,,	508	4·1	23·30	
Honeycomb	Shorthorn... ...	29 Aug., 1911	491	4·2	23·09	
No. 6 ...	,, ...	12 Jan., 1912	516	4·0	23·05	
Mist ...	Holstein	2 Oct., 1911	521	3·9	22·67	
Dewdrop ...	,, ...	3 Nov. ,,	503	3·9	21·89	
Careless ...	Jersey	16 Dec. ,,	379	5·1	21·83	
Duchess Fanny	Shorthorn... ...	24 Aug. ,,	527	3·7	21·68	
Dilly ...	,, ...	9 Feb., 1912	476	4·0	21·26	
Burton's Lady	,, ...	7 Dec., 1911	471	4·0	21·04	
Lass ...	Ayrshire	16 Oct. ,,	447	4·2	21·04	
Silver Nell ..	Shorthorn... ...	13 Dec. ,,	452	4·1	20·23	
Bracebridge I.	,, ...	16 Mar., 1912	465	3·9	20·23	

NOTE.—Butter, Nellie II., No. 6, and Redrose were fed with a daily ration of 30 lb. mixed chaff, 3 lb. bran, 3 lb. pollard. The rest of the dairy herd were on natural pastures only.

FEEDING YOUNG PIGS.

One of the secrets of success in raising young pigs is to feed often and little at a time. Anyone not thoroughly acquainted with pigs would be surprised at the very great number of times during the twenty-four hours a sow suckles her little pigs. For this there appear to be at least two good and sufficient reasons—one is, that the sow is unable to carry a large quantity of milk for her numerous family; and the other, that the stomach of the pigling is not capacious enough to stow away any great quantity of food at one time.

As the pigs arrive at weaning time, we generally mix with the sharps a small proportion of meal; this we increase as they grow older, until at, say, ten weeks old the youngsters will thrive well on one-fourth meal and three-fourths sharps.

One most important point in connection with the management of young pigs is the general belief amongst buyers of fat pigs that the meat from a pig which has been allowed, as is far too frequently the case, to live a considerable time as a store pig in the hope—vain though it may be in the majority of instances—that the growing pig will eat and pay for certain odds and ends about the farmyard that would otherwise have been wasted, is inferior meat. The bacon-curers are stated to place a higher value per stone on those fat pigs which are fattened early in life on the concentrated system of feeding—*i.e.*, in such a manner that they never receive a check, and are, therefore, fat at a much earlier age than the ordinary pig of the country. The breeders and feeders of pigs must continually bear in mind that the only hope of making pig-keeping really profitable lies in their producing pork of the best quality, and this can only be accomplished by breeding from those animals alone which are possessed in a marked degree of those points such as early maturity, quick growth, fine quality of bone and offal, and then by so feeding the animals that every advantage is taken of the two former essential qualities in their feeding stock.

A pig should make 1 lb. in weight for every day of its life. If it does this, it is ready for market at any time after it is six months old. For the summer markets, heavy weights are not wanted. Six or eight months should be sufficient to make all the growth desired.

Give the pigs exercise while they are growing. Give them access to salt, sulphur, and ashes. Do not overfeed at any time, and, when they have made size, fatten them as rapidly as possible, and sell them the day they are finished for market.

To secure the greatest gain in feeding pigs that are still suckling, it is necessary that the sows be fed all that they will eat up clean. It is often the case that, when pigs begin to eat, the sows are stinted. It pays better to feed two lots of pigs during the year to 200 lb. than one lot to 400 lb. Young pigs pay better than old ones for the food they eat, and make better meat. Light, lean pork encourages the use of pork, and out of increased consumption come better markets for the producer. The older the pig, the more its cost to sustain growth, because there is more to sustain. Instead of the rate of growth increasing with the weight of the animal, it diminishes, and every additional pound of growth costs more until the point of profit is reached.

It matters not how well cared for in other respects, the pig will never be thrifty unless he has plenty of pure, fresh water. This important point is, perhaps, more often neglected than any other. Slop will not answer the purpose of drinking water entirely, though it is,

of course, a partial substitute. The man who will pen up pigs, or any other animals, in a field entirely destitute of shade ought to receive the attention of the Society for the Prevention of Cruelty to Animals. Such protection from the sun as a wire fence is hardly sufficient. Shade trees here and there, or a rough shed, are necessary. The man who produces the largest amount of pork at the least cost, and that of the best quality, will make the most profit. The chief item in the bill of cost is feed. Generally, the cheaper the feed, the greater the profit. Corn (maize, that is) is not the cheapest feed in this country, nor does it, when fed exclusively, make the best quality of meat for the best market. A varied diet of grass and other green and succulent products, containing more flesh-forming constituents than corn, will be found cheaper and to make better pork—corn for lard, and grass for meat.

The kind of feed and the care the dam receives while the pigs are in the embryo state have much to do with the size, character, constitution, and value of the litter. She should have plenty of exercise, and this is best secured in a stubble sod field that is intended for fallowing in the following season. A stubble field is a splendid place to winter the brood sows, if they have access to a straw stack for shelter. If they are not ringed, all the better; they will root a little, perhaps, but all the better for the ground. Pigs confined in small muddy yards take too much earth and filth into the stomach, and, as a consequence, the bowels become constipated, the system fevered, and indigestion follows, with loss of appetite. The carcass of a pig in this condition gets smaller, while hair and bristles grow just the same, giving the pig some resemblance to a porcupine. The natural food for pigs in a wild state is grass, roots, and bulbs of plants. The necessity for this character of food is well recognised by Nature in providing the pig with a rooter for the purpose of obtaining it. Even after generations of domestication, with an ample supply of sustenance to satisfy all demands, this proclivity or desire to root, independent of necessity, remains a prominent characteristic. Farmers who have practised from this pointer—and during the winter months have, at stated intervals of at least twice a week, given one feed of potatoes, beets, artichokes, or turnips—have found that the pigs not only relish them, but derive great benefit from them. They are conducive to a perfect condition of the system, stimulating the action of the various organs in the performance of their functions. They aid in the digestion and assimilation of the more solid food. Brood sows are especially benefited by a regular supply of root diet while pregnant as well as their young. Indeed, it is almost compulsory to ensure strong, healthy pigs and a natural farrow. Lumps of salt should be placed within the reach of all pigs, and a little sulphur mixed with their food will have a beneficial effect. They are also extremely fond of coal cinders, and they will even eat coal itself; this assists digestion. Pigs should also, as stated, be supplied with pure, fresh water, and the water trough should be frequently cleaned out. If cleanliness, plenty of fresh air, clean water, regularity of feeding, and shelter be attended to, you will not be troubled with much disease or death among your pigs.

COWPEAS FOR SWINE.

When cowpeas are planted for green manure, it is an excellent practice to turn pigs into the field about the time when the first peas are ripening. Young pigs thrive amazingly on the succulent foliage and well-filled pods, and the quality of pork raised on such a healthy and nutritious diet is very fine. This is a profitable method of fattening pigs, or of preparing them for topping off with corn or sorghum for market. An acre of ripening cowpeas will pasture from fifteen to twenty pigs for several weeks, and the gain in fertility from the droppings of the animals during that period will more than counterbalance the fertilising value of the forage eaten. The rapid increase in weight will thus represent so much clear profit, and the farmer is richer by half a ton or more of prime pork for every acre planted. In the United States pigs are turned out to pasture just as dairy cattle and horses are in this country. This method has been very successful, and it would be well for our farmers to adopt this system, which has been introduced at the Queensland Agricultural College. Cowpea is well known in this State, and has been largely cultivated, but it is apparent that, notwithstanding the opportunities that our farmers possess for improving the management of their farms, little advantage is taken of the experience of others who have made a success of a certain branch of agriculture. There is money in the breeding of pigs, and the farmer who intends breeding should endeavour to study what is required for local purposes. Pigs require wood ashes for their best interests.

DANGERS OF SWILL FEEDING.

Pig-feeders who live either in or near large towns invariably do their share of swill-feeding. Examination of the swill taken from hotels and refreshment-rooms will often disclose broken glass, tins, &c. Now, when these happen to get into the feeding trough, the pig, feeling something lumpy, naturally makes a dive for it, seizes it, and crushes it. The result is that it generally gets badly cut, and, its mouth becoming sore, it is thrown off its feed. Some feeders think that to examine swill is time wasted, but it will take a lot of time so wasted to pay for a pig if lost by accidents of this kind.

FEEDING EXPERIMENTS WITH THE YORKSHIRE, BERKSHIRE, AND TAMWORTH BREEDS.

It will interest breeders of pigs to know how the three leading breeds—the Yorkshire, Berkshire, and Tamworth—fared in experiments made at the Ontario Agricultural College. The experiments lasted for four months—July to October; and the animals (thirty-six in number) were about eight weeks old when put under trial. The different lots were fed on exactly the same foods (consisting largely of peas, pollard, and whey) all through the experiment. The results showed but little advantage in favour of either of the breeds tested; the average gain during the 112 days over which the experiment extended ranged from

117 to 123 lb., or a little over 1 lb. per pig per day. The Large Yorkshire headed the list with a total gain of 123¾ lb. in the 112 days, the Berkshire coming next with a total gain of 120 lb., and the Tamworths third with a total increase of 119¼ lb. An instructive feature of the experiment was the result obtained as to the quantity of food required by each breed in order to produce a certain quantity of pork. The quantity of grain food consumed to produce 100 lb. of weight ranged from 350 to 383 lb.; Yorkshires standing at the head of the list as requiring the smallest quantity of grain, the Berkshires second, Duroc Jerseys third, and the Tamworths fourth.

THE RESULTS.

Breed.	Total Gain per Hog in 112 Days.	Average Daily Gain per Hog.	Meal consumed per 100 lb. Gain.
1. Yorkshire	123.75	1.10	350.1
2. Berkshire	120	1.07	369.79
3. Tamworth	119.25	1.06	377.77

The above table gives the detailed particulars on this score in the case of the three breeds which possess any practical interest for our readers.

HOW THE YORKSHIRES TURNED OUT.

Great length, side of even depth throughout, sides full of flesh, great length between shoulder and ham, fat even on the back, bone moderate, head small, forearm too long, belly only moderately thick, shoulders moderate in size. These pigs have qualities which make them peculiarly suitable for cross-breeding purposes on account of their great length, great development of flesh, and even depth of the side.

HOW THE BERKSHIRES FARED.

Flesh well developed, fat even down the back, well-developed sides of reasonably even depth, rather irregular in length, head moderate with rather large jowl, bone moderate; generally good hogs; but show a decided tendency tendency to uneven development, as evidenced by the great irregularity in the length.

THE TAMWORTHS.

Moderate bone, a long head but small jowl, flesh well developed, slight tendency to fat to arch on the crown, which would possibly cause too many sides to be classed as "fat" on account of thickness at this one point if hogs were moderately well fed, belly thick and very excellent; generally a desirable type of hog, which, with judicious feeding, ought to make good export sides.

COST OF PRODUCTION.

In this experiment a rather interesting point was brought out. It has been shown by other experiments that the cost of producing 1 lb. of gain in pigs increases as the animal becomes heavier. As the animals included in this test were weighed at regular intervals, and as every pound of meal which they consumed was carefully weighed, an opportunity was afforded to test further the truth of the claim, and a statement of the results is given below. These results are computed from the gains made and the food consumed by thirty-six hogs, so that they afford very conclusive evidence. In computing the average weights of the hogs, fractions of pounds were neglected, the nearest whole number of pounds being taken in each case:—

While increasing in live weight from 54 lb. to 82 lb., the pigs required 3.10 lb. meal per 1 lb. gain.

While increasing in live weight from 82 lb. to 115 lb., they required 3.75 lb. meal per 1 lb. gain.

While increasing from 115 lb. to 148 lb., they required 4.38 lb. meal per 1 lb. gain.

While increasing from 148 lb. to 170 lb., they required 4.55 lb. meal per 1 lb. gain.

This statement shows that there is a steady increase in the amount of meal required to produce 1 lb. of gain as the hogs increase in weight, and is a strong argument in favour of marketing hogs by the time or a little before they reach 200 lb. in live weight.

In rearing and fattening pigs, the following data may be considered:—

Take a young pig weighing 20 lb. dressed weight, at 6d. per lb., equal to 10s.; 5 lb. of wheat will add 1 lb. of pork to its weight, and 400 lb. of wheat will make 80 lb. of pork; total, 100 lb.; value, say, 4½d. per lb.; equal to £1 17s. 6d. Then we have cost of pig, 10s.; cost of 400 lb. of wheat, say, 16s. 8d.; total cost, £1 6s. 8d., giving a profit of 10s. 10s.

. . . .

Now, take a grass-fed pig weighing 100 lb. dressed, value £1. It would need 6 lb. of wheat to add 1 lb. of meat to his carcass, and 600 lb. of wheat to make 100 lb. of pork. We can reckon this 200 lb. as worth 3d. per lb., equal to £2 10s. The cost of the pig is £1; of wheat, £1 5s.; total, £2 5s.; thus showing a profit of 5s. only. So it would not appear to be wise to buy store pigs for fattening. The pure Berkshire will pay better to breed and to fatten than the Berkshire and Essex cross. Great care should, however, be taken in selecting the animals. Always, if possible, get them from a person who takes care of his stock.

ADVICE ON THE ROUTINE OF THE DAIRY.

By E. GRAHAM, Dairy Expert, Department of Agriculture and Stock.

[CONTINUED.]

All milk and cream should be subjected to prompt cooling, and no unnecessary delay should be allowed to intervene between the time the milk is drawn from the cows and the actual application of the cooling and aerating process.

The climatic conditions under which the milk or cream supplies of this State are raised are such as demand that the practice of cooling should form part of the daily routine of the dairy.

Milk and cream, no matter how perfect in flavour at the outset, are highly perishable products; and changes of a deterioratory nature will speedily take place unless systematic action is taken to arrest the natural alteration in quality.

All things being equal, the deterioration to which milk and cream are subject is largely governed by the temperature at which these products are held.

The lower the temperature maintained, the longer will the milk or cream remain sweet and sound in quality.

The process of cooling may be carried out in the following manner:—

> From an elevated receiving vat the milk, or from the separator spout the cream, may be conducted over any of the standard coolers. These are of various designs, and permit of the milk or cream passing in a very thin layer over a more or less extensive surface, the inside of which is usually cooled by a circulation of cold water.

This process, if rightly carried on, may accomplish two things—(*a*) The rapid cooling of the milk or cream; (*b*) the elimination of odours therefrom.

The importance of the cooling and aeration of the milk or cream is obvious, but the air and surroundings where it is done must be pure and clean.

The milk or cream in transit from farm to factory must be fully protected from the sun's rays.

The hauling of milk and especially cream for long distances is a necessary condition imposed upon dairymen and cream-collectors in many parts of Queensland.

Unfavourable temperature conditions extend over a large portion of the year, and some means of protection of the dairy products from the hot sun is absolutely essential.

It is much the better method to have a hood or cover attached to the conveyance in which the milk or cream is carried than to place a covering directly over the cans.

The former method allows of a current of shaded air to pass between the cans and the protecting shade cover—an advantage not to be gained when the covering rests directly on the cans.

All that has been said thus far as pertaining to the improvement of the milk supply applies with just as much force to the production of wholesome cream. While the cream represents only a small proportion of the original milk from which it was extracted, it has a comparatively higher commercial value, and any unfavourable influence incident to the production of the milk is usually to be detected in the cream.

In diverting our attention more directly to the production of cream, we will first take the separator, the medium whereby the butter fat is won from the milk.

In common with any other piece of apparatus used in the treatment of milk or cream, the separator must be kept scrupulously clean. The disastrous effects of using a foul separator bowl can be imagined only when we recall the fact that all cream passing through it becomes seeded with the bacteria it contains.

Unless the cream is subsequently pasteurised, the harmful germs introduced into the cream are certain to develop injurious flavours that are ultimately carried into the resultant butter, which, as a consequence of the injury to its qualities, realises less than first-class market quotations.

This one cause of bad flavours in butters alone, accruing from neglect to always cleanse the separator bowl after use, levies a heavy toll upon the butter industry in this State, and the loss could be easily obviated.

The bowl and the milk-soiled parts of the separator must be taken apart and washed every time the separator is used. This is imperative not only for sanitary but for economic reasons, as will be pointed out later.

Where a separate dairy-house is available, the separator is best placed there, and not operated in a partitioned portion of the milk shed or in any place where the air or the surroundings are imperfect.

I have seen farm separators placed in dilapidated outbuildings and even out of doors, where they serve as lodging-places for dust and filth at times when the machine is not in use. Nothing could be more antagonistic to good quality of the cream—in fact, such conditions are contrary to law, and place the owner liable to prosecution.

A simple clean room with impervious sloping floors, well ventilated, fitted with screened windows and doors, and with good drainage, can be made to well serve as a place wherein to separate the milk. Further, the initial cost of the separator is of itself sufficient to emphasise the need of protecting the machine from harmful influences.

Every separator supplied to the dairymen is usually accompanied by specific directions for guidance in both setting up and operating the machine. The instructions given should be carefully followed.

Assuming that all parts of the machine are properly adjusted, the first requirement is a firm foundation. With care most hand sizes of separators can be set upon solid wooden floors so as to run satisfactorily. Unless it is a firm floor without vibration, it will not do. A concrete

pier, with bolts embedded for attaching, say, 2 in. by 4 in. or 4 in. by 4 in. pieces of hardwood to which the separator may be lagged, is a satisfactory method, as all vibration is thus avoided.

Pieces of 2 in. by 4 in. hardwood bolted to a cement floor may be made to serve as well.

Care must always be taken to set the frame perfectly level, as otherwise the bowl will not be properly balanced and fail to run true.

Placing a machine upon skids or a foundation of a temporary nature is, to say the least, a questionable practice.

ANGORA GOATS.

Of common goats there are, according to the Government Statistician's report for 1910-11, some 168,339 depastured in the State, and from amongst these many white nannies have been selected for the purpose of the production eventually of pure Angora goats. This valuable breed is steadily, if slowly, coming to the front. Each year witnesses an increase in the number of animals and the quantity of mohair, as is shown by the following table published in the Annual Report of the Under Secretary for Agriculture and Stock for the year 1910-1911:—

Year.	Number of Animals.	Mohair Obtained—Lb.	Skins Obtained.	Number Killed for Meat.
1904	2,008	1,216	208	497
1905	2,855	902	320	643
1906	2,512	1,358	160	475
1907	4,589	3,073	996	1,028
1908	7,698	5,102	980	1,181
1909	8,228	6,547	1,374	1,739
1910	9,088	7,096	1,753	1,823

We are frequently asked where Angoras may be purchased. The districts whence the greatest number were returned are:—Dalby, 1,093; Banana, 1,087; St. Lawrence, 988; Emerald, 799; Rockhampton, 594; South Brisbane, 531; Eidsvold, 410; Springsure, 317.

Again, innumerable questions reach us from time to time as to profits to be derived from breeding Angoras, the most suitable climate, the prolificity of the goats, the amount and value of mohair they will produce annually, &c.

These questions have been frequently answered; but, for the benefit of the many new settlers in districts which are eminently suited to the requirements of this valuable animal, we place before our readers the following "catechism," which was some time ago published in the "Stock Breeder" and condensed for "Garden and Field." Besides this, those interested in the subject will find exhaustive articles on Angoras in the volumes of this journal from Vol. V. to Vol. XXIV.

What we have called the "catechism" on Angoras is as follows:—

1. Are Angora goats more profitable than sheep?

Angora goats are more profitable than sheep where your range is too rough, poor, and brushy for sheep, and especially if you want to run cattle and horses on the same range and leave the grass for the larger animals. It is very profitable to run some goats with sheep, particularly where there are more or less brush and weeds in the sheep range.

2. Are they more troublesome to raise than sheep?

They are less troublesome to raise than sheep when you have learned how to manage them.

3. Should they always be herded?

Angoras can easily be trained to come home at or before sundown, and are more regular about their homecoming than any other kind of stock. And where there are no wolves or other kinds of animals they need not be herded.

4. Can they stand a cold climate?

They stand more dry, cold weather than any other kind of stock, and should always have a dry shelter during cold rains.

5. Do they protect themselves against wolves and dogs?

They will protect their young kids quite bravely, but when overpowered will give up the fight and run.

6. Is their meat as good as mutton?

The meat of the Angora is not surpassed in flavour and wholesomeness by any other flesh in the world, and many people believe it surpasses all other meats.

7. Must they be fed in winter?

On good range the Angora needs no other feeding.

8. Are they as prolific as sheep?

Generally the Angora doe brings but one kid annually, unless there are twins.

9. What is the average price of mohair?

Good mohair from well-bred goats brings from 1s. to 1s. 8d. per lb. in New York, according to quality and demand.

10. How old should Angora mutton be when sold to the butcher?

If you have only a few Angora muttons you can sell to your neighbours what you do not use yourself, but it pays better to keep them to raise mohair until they are eight or ten years old, especially in the south (Southern States, U.S.A.), where they are shorn twice a year.

11. How much mohair will the Angora produce yearly?

A good, well-bred Angora should shear 6 lb. a year on good range.

12. How many Angoras can be kept to the acre of brush land pasture?

On good range where there is plenty of weeds, herbs, small trees, brush, and other thick undergrowth, you can raise about five goats to the acre, but they should not be kept too long on the same range—at least no longer than they keep "rolling fat" all the year. (These are American conditions.—Ed.)

13. Do Angoras need running water?

Running water is best for goats, but tank water will do where it is not befouled by manure, mud, &c.

14. To what age can they be profitably kept?

It pays to fatten Angoras for meat and their pelts at fourteen or fifteen years of age.

15. Are they dainty as to what they eat?

They will eat any kind of food that is good for cattle.

16. Are they subject to disease?

Angoras are as healthy as any animals in the world.

17. Is it hard to keep them within a fenced pasture?

They are not so easily kept fenced in as sheep, but a straight, upright rail, board, or wire fence, 3½ ft. high, will hold them if there are no holes large enough to crawl through. They will climb over or crawl through, but will never jump a perpendicular fence.

18. Is it troublesome to make the does own their kids?

Does that are soon to bring kids should be kept in a separate pasture until the kids are a few days old. If handled in this way, there is little trouble over their not owning their kids, as they generally show great affection for them.

19. Will a doe give more milk than one kid will suck?

The first few days after kidding it is necessary to milk the deep milking does until the kid is large enough to take all the milk.

20. Can they easily be broken for milking?

Goats can easily be trained to jump upon a box or bench to be milked, and their milk is said to be the most wholesome of any milk in domestic use.

21. Are the bucks bad about fighting?

I never owned an Angora buck that ever offered to fight anybody. They will fight each other, and sometimes fight dogs, wolves, hogs, &c.

22. Will the goats come home at night?

They will come home before sundown with more regularity than any other farm animal.

Poultry.

EGG-LAYING COMPETITIONS IN THE SOUTHERN STATES.

ROSEWORTHY AGRICULTURAL COLLEGE, S.A.

The following are the names and scores of those pens which exceeded 1,200, which is in these days considered the limit below which no pen with any pretensions to class can go; still a good many of them manage to do so sometimes:—

ROSEWORTHY FINAL SCORES.

Six pullets in each pen. Eggs laid for the month of March and the year from 1st April, 1911, to 31st March, 1912:—

LIGHT BREEDS, WHITE LEGHORNS (EXCEPT WHERE OTHERWISE SPECIFIED).

	Total.
Redfern Poultry Farm	1,589
Mrs. P. A. Uren	1,319
A. H. Padman	1,297
Moritz Brothers	1,289
C. B. Bertelsmeier	1,270
G. A. Collins	1,269
Range P. and E. Farm	1,257
E. W. Hurford	1,256
C. A. Collings	1,240
A. J. Cosh	1,234
C. Hay	1,229
J. Ellery and Son	1,227
W. P. Eckermann	1,224
R. Carling	1,217
W. Purvis	1,212
P. Sickert	1,204
C. B. Bertelsmeier	1,202
Miss G. Purvis	1,200

In the heavy-breed section owners have no doubt been seriously disappointed, for the following seven pens are the only ones which made even a respectable showing:—

HEAVY BREEDS.

	Total.
Craig Brothers—Black Orpington	1,189
G. Toseland—Langshan	1,121
B. P. Martin—Black Orpington	1,102
E. McKenzie—Black Orpington	1,084
S. Brundett—Black Orpington	1,068
Killara P. Farm—Black Orpington	1,047
E. V. Cant—Silver Wyandotte	1,021

In the light-breed section, 1,200 and over, there are several new names; and Mrs. P. A. Uren is to be particularly congratulated on the excellent showing made by her birds. Mr. Padman, one, of course, expects to be at least as high as his name stands on this list. Messrs. Moritz Brothers are no strangers to one of the top places in competition lists. Mr. C. B. Bertelsmeier has, of course, been there before, only more so, for he was the joint holder of the South Australian record of 1,531, which Mr. Walsh has just upset. Other competition winners—Mrs. A. E. Kinnear and Ontario Poultry Farm—are both so low that it is kinder not to disinter the actual figures. We hope that this eclipse is only temporary.

The following summary of results will be interesting to those of a statistical turn of mind. They will be found useful in proving more or less conclusively either that poultry pays or that it does not:—

Summary of Roseworthy Results.

Number of birds (126 pens), 756; total number of eggs laid, 133,093; value, £545 6s. 3d.; cost of feeding, £188 14s. 9d.; profit over cost of feeding, £358 11s. 5d.; average eggs laid—per pen 1,056.29, per hen 178.04; cost of food per pen of six hens, £1 10s.; profit over cost of food per pen, £2 16s. 8d.; eggs laid by winning pen, section I., 1,589; highest monthly score, 163 eggs; highest weekly score, 40; total weight of eggs laid, 17,323 lb.; average weight, 2.09 oz.

KYBYBOLITE.

Messrs. Moritz Brothers' lead at this competition was not so marked as was the case at Roseworthy, but was nevertheless a very comfortable one almost from start to finish. It is interesting to note the relative scores of housed and unhoused birds entered by the same owner, and also the housed birds this year with those which competed last year under much more trying conditions. The value of adequate housing is plainly shown, though, unfortunately, the actual profit of so doing is not so manifest.

The following are the prize-winners in this test:—

Kybybolite Prizewinners.

Light Breeds: Moritz Brothers, 1,464 eggs, £10; H. F. and A. C. Vorwerk, 1,306 eggs, £5; "Mahama," 1,274 eggs, £3; J. Jarrad, 1,196 eggs, £2; Sargenfri Poultry Yards, 1,191 eggs, £1. Heavy Breeds: Mrs. D. McNamara, 844 eggs, £10; H. Bail, 783 eggs, £5; S. Staunton, 774 eggs, £3; A. Phillips, 748 eggs, £2; Mrs. D. McNamara, 717 eggs, £1. Prize for heaviest total yield of eggs, Moritz Brothers, Kalangadoo; score, 1,464; weight of eggs, 190 lb., £3.

BURNLEY (VICTORIA).

It cannot be said that this competition started under very favourable conditions. There were many unsatisfactory rumours, and a whole set of disasters was foretold. However, the clouds rolled by, as clouds have a way of doing, and the Victorian Government, who organised the competition through their expert, have the satisfaction of knowing that excellent figures have been put up, and that much renewed interest in poultry breeding has been aroused. Its nearness to Melbourne has been a point in its favour, and we read that immense numbers have visited the contest. Coming to figures, the outstanding feature is that three pens have passed the 1,500 mark. This is the first time this has been done in competition history. Mr. Pope, the winner, has the satisfaction of knowing that he beat the previous world's record by two, his score being 1,566. He was unfortunate, however, in that Mr. Walsh's pen over this side had been even a little more busy, so that though he beat the old record he does not hold the new one. Mr. Swift was the second, and he was well over 1,500; whilst Mr. A. J. Cosh, of South Australia, put up the third of the big totals.

HAWKESBURY (NEW SOUTH WALES).

One always looks for solid results rather than sensational records in the Hawkesbury competition report. Mr. Thompson does not waste time over abstract problems, but gets down to the bones of the matter in very few words. One point of great interest during the last competition has been the test carried on between ten pens meat-fed and ten pens fed no meat—all being of the same breeding, and the management and feeding being the same. At the commencement of the test the opinion was freely expressed that the no-meaters had not even Buckley's chance; now, however, that the numbers are up there is quite a different story to tell, and the figures are certainly instructive. It would, of course, be a mistake to take the figures as final, but they are certainly an indication that too much stress has been laid on the meat ration for poultry.

The test was for a period of twelve months, and finished on 31st March, with this result:—

	No Meat.	Meat Fed.
Total eggs laid	11,112 ..	11,665
Average per hen	185 ..	194
Market value of eggs per hen ..	18s. 10d. ..	19s. 4d.
Cost of feed per hen	5s. 10d. ..	6s. 1½d.
Profit over feed per hen	13s. ..	13. 2½d.

As regards the general condition of the hens at the finish, the conductor says:—" No appreciable difference was to be noted at the close."

For several years the test of the relative laying of first, second, and third year hens has been carefully tested, and much that is of interest has been observed and recorded. The accumulated results may be said to indicate that on the question of profit there is little difference between the first and second year hen, taking into account, of course, the first six unproductive months of the hen's life. To anyone contemplating poultry-keeping on anything like a large scale, the settlement of questions such as these is of very great value. The actual figures for this year are as follows:—

Average Eggs per Bird.—First year, 300 pullets, 184; second year, 180 hens, 140; third year, 60 hens, 130.

Profit over Cost of Food per Bird.—First year, 300 pullets, 8s. 7d.; second year, 180 hens, 8s. 3d.; third year, 60 hens, 5s. 8d.

THIS YEAR.

The record entry for the present competition at Roseworthy is a fairly solid answer to those who predicted a year or two back that interest in competitions was on the wane. As far as the general public is concerned, it is probably correct, but any test which can draw competitors from all parts of the Commonwealth, including the Victorian Invading Army, is doing good work for more and better poultry. We do not believe that it can be maintained that our competitions, as at present conducted, are doing the most possible good for the industry. It may, of course, be true that what is being done at Hawkesbury need not be duplicated elsewhere. That argument is, however, we think, fallacious, and in any case there are many problems in poultry work. We hear that the birds sent up are, if anything, a more representative lot than has been the case in any other competition. Competitors at last appear to pretty generally understand that maturity as apart from actual age is an important factor. To those who have commenced well, we wish good fortune; and to those who have not commenced, a little bit more of the same.—"Garden and Field."

REPORT ON EGG-LAYING COMPETITION, Q.A. COLLEGE, MAY, 1912.

One thousand eight hundred and forty three eggs were laid during the month. Some of the birds have gone into moult, the pens most affected being those owned by Wilson, Cornish, Craig, and Yangarella. Mr. Bradburne's pen wins the monthly prize with 125 eggs. The following are the individual records:—

Competitors.	Breed.	May.	Total.
A. H. Padman, Adelaide, S.A.	White Leghorns ...	95	213
Mrs. Beiber, Childers	Brown Leghorns ...	107	199
W. D. Bradburne, Bexley, N.S.W. ...	White Leghorns ...	125	175
J. Gosley, Childers	Do.	119	169
E. A. Smith, Paddington, Brisbane ...	Do. (No. 1)	103	165
A. T. Coomber, Bundaberg	Do.	87	162
B. Holtorf, Beaudesert	Do.	96	162
A. R. Wooley, Cairns, N.Q.	Do.	112	149
Range Poultry Farm, Toowoomba ...	Do. (No. 1)	89	137
E. A. Smith, Paddington, Brisbane ...	Do. (No. 2)	79	137
T. Fanning, Ashgrove, Brisbane ...	Do.	98	129
Mrs. Dredge, Bundaberg	Do.	82	129
H. Tappenden, Maryborough	Do.	57	118
R. Burns, Sladevale, Warwick	Black Orpingtons ...	97	117
J. Holmes, Toowoomba	White Leghorns ...	51	98
R. Burns, Warwick	S.L. Wyandottes ...	68	98
Yangarella Poultry Farm, Indooroopilly	White Leghorns ...	40	96
Cowan Bros., Burwood, N.S.W. ...	Do.	65	88
J. R. Wilson, Eudlo	Do.	41	84
W. W. Hay, Warwick	Black Leghorns ...	28	63
J. F. Dalrymple, Bexley, N.S.W. ...	White Leghorns ...	19	56
H. Hammill, Kogarah Bay, N.S.W. ...	Do.	41	55
Mrs. Sprengel, Boonah	Do. ..	41	45
Range Poultry Farm, Toowoomba ...	Do. (No. 2)	35	42
F. G. Cornish, Toowoomba	Do.	20	41
J. Zahl, Boonah	Do. (No. 1)	24	24
D. Grant, Boonah	Do.	18	18
Mrs. G. Craig, Miriam Vale	Do.	0	15
R. Burns, Warwick	Do.	4	6
J. Zahl, Boonah	Do. (No. 2)	2	2
Total	...	1,843	2,992

NOTES FROM WESTBROOK STATE FARM.

AN OLD MAN SALTBUSH—(*RHAGODIA PARABOLICA*).

All through the dry weather of 1911 (says Mr. Mitchell, manager of Westbrook State Farm), a few large clumps and a hedge about two chains long of saltbush known to pastoralists as "Old Man Saltbush" have grown luxuriantly here; and the plant has been proved to be of sterling value as a forage plant during dry times such as we have passed through. All farm stock eat it; cattle and pigs are especially fond of it; and as a salinous plant it is most valuable in aiding digestion, especially at a time when green feed is scarce and hay has to be resorted to as feed. *Rhagodia parabolica* is an erect shrub growing about 9 ft. high where it is not interfered with by stock. It is very densely clothed with foliage, and is very ornamental as a hedge plant. It stands cutting, and can be worked into any shape. Plants are easily propagated by seed or cuttings in early spring. Farmers would find a small plantation a most beneficial acquisition during time of drought.

[The true Old Man Saltbush is *Atriplex nummularia,* and is depicted in Vol. VI. of this journal.—Ed. "Q. A. J."]

State Farms.

TROPICAL FRUITS AT KAMERUNGA STATE NURSERY.

MANGOSTEEN.

BY C. E. WOOD, Manager Kamerunga State Nursery.

In mentioning some of the fruit trees growing at the Nursery, I will begin with some that are not yet in bearing. I have seen it mentioned in the papers that this nursery should have, amongst other fruits, the Mangosteen, Sapodilla Plum, and Rambutan. As this was evidently written without first inquiring at this institution as to what trees were being grown, I may mention here that all these fruit trees have been introduced and are at present represented here. The Mangosteen (*Garcinia Mangostana*) has always proved a difficult subject to acclimatise, and even in Ceylon I believe it was a good many years before they got the first tree to fruit. Then, again, even if you have young plants, it is by no means an easy tree to transplant; otherwise this famous fruit would be found more generally distributed than it is. The tree at the Nursery is now about twenty years from the seed.

Fruit was sent over from Java, and seed planted; three plants were later put out in the field, but only one survived. Owing to the very slow growth made by this tree, special treatment was started about two years ago, artificial manures being used; and all through the dry season of last year the tree received daily watering all over. At the present

PLATE 1.—"GARCINIA MANGOSTANA" AT KAMERUNGA STATE NURSERY.

time the tree, though small (considering its age), presents a healthy appearance, and it is hoped that flowers and fruit will yet be produced. Up to the present I am unaware of anybody having a tree of *Garcinia mangostana* which has borne fruit in Australia; the so-called "Mangosteen" of Port Douglas and other places being the fruit of *Garcinia cochinchinensis* or *Garcinia xanthochymus.*

The accompanying photograph will give some idea of the tree *Garcinia mangostana,* and the following measurements will show it is answering to treatment:—

	Jan., 1910.	May, 1912.
Circumference of stems 3 ft. from ground	5½ in. ..	7 in.
Circumference of stems at base	8 in. ..	10 in.
Height of tree	6 ft. 8 in. ..	9 ft. 10 in.
Spread of branches	5 ft. 4 in. ..	8 ft. 9 in.

NITRO-BACTERINE.

BY R. SOUTTER, Manager, Bungeworgorai State Farm, Roma.

Some few years ago, owing to the apparent danger (happily now passed) in the course of a short space of time of a serious shortage of nitrogen for agricultural purposes, through the exhaustion of our chief supply, the guano and nitrate beds, scientists set about to discover in what manner it could be met. Of course it was well known that the air would have to furnish the supply; but how it was to be obtained therefrom in a form available for plant food, in sufficient quantities and at a cost commensurate with what it was required for, was the greatest obstacle.

Professor Bottomley, of the Botanical Laboratory, King's College, sought the assistance of Nature, whom he assisted in return. He found that he could cultivate the nitrogen bacteria found on the roots of the leguminous plants, and prepare a culture for the farmer which would enable him to have the nitrogen of the air made available to this growing crop.

This culture he called nitro-bacterine.

Experiments were carried out with this culture here last season; but, as the weather conditions were extremely adverse for the propagation of the bacteria, very little benefits were appreciable in the results, and such as were may have been brought about by outside factors.

NITRO-BACTERINE—PROFESSOR BOTTOMLEY'S CULTURE.

The culture was prepared according to directions supplied, but the mixture did not turn cloudy until the fourth day.

As soon as it reached this state, some wheat and hairy vetch seed were dipped, dried in the shade, and sown.

No differences either in time of germination or percentage were noticeable between the treated and untreated seed.

Though the mixture is said to hasten maturity, no difference was noticeable in the wheat; the vetches were prematurely dried off upon the advent of summer in conjunction with the long dry spell.

MELVILLE'S TREATMENT.

In addition to the foregoing, sowings were made of seeds treated by Mr. J. J. Melville's process for hastening on the maturity of the resultant crops, and by whom the seeds were supplied to the Agent-General for Queensland. The following treated seed was received early in June:—Sample Black Oats, Irish Wheat, Canadian No. 1 Hard, and Red Essex.

Two sowings were made in well-worked soil sufficiently moist to promote germination; the first being on the 6th June, and the other on the 5th July.

In the latter part of July another two varieties were received and sown in August.

As in the previous experiment, the dry weather was the chief factor which prevented any valuable results being obtained, though there were others present which, even had favourable conditions prevailed, would have reduced the value of results considerably. Fortunately these are not like the weather, and the experience of this season will prevent them from being present in future.

Though no finality was arrived at, a result of the tests, so far as they were carried, is given:—

Treated Seed.—Black Oats; sown, 6th June; appeared, 16th; germination, 90 per cent.; earing, October, third week.

Control.—Garton's Bountiful Oats; sown, 6th June; appeared, 16th; germination, 95.2 per cent.; earing, November, first week.

Treated Seed.—Manitoba No. 1 hard; sown, 6th June; appeared, 16th; germination, 6.6 per cent.; earing, October, second week.

Control.—Manitoba No. 1 hard; sown, 6th June; appeared, 16th; germination, 96 per cent.; earing, October, second week.

Treated Seed.—Irish Wheat; sown, 6th June; appeared, 16th; germination, 81 per cent.; earing, October, fourth week.

Treated Seed.—Red Essex; sown, 6th June; appeared, 16th; germination, 98 per cent.; earing, October, fourth week.

Control.—Red Fife; sown, 6th June; appeared, 16th; germination, 98 per cent.; earing, October, third week.

The duplicate sowing made on the 5th July, with the exception that a slightly better germination percentage was obtained with the treated Manitoba seed, gave the same results.

The seed received in July furnished grain of two Queensland varieties, and the untreated grain for check purposes was obtained from the manager of the Warwick mill. The seed was sown 1st August, and germinated 12th August. The varieties were Free's Abundance and Indian Pearl; the treated and untreated of both varieties came into ear third week in October.

The varieties received in the first batch were long-season wheats, which kinds, even in a good season. do not mature in the manner they should, being generally ripened off by the hot weather.

The second did contain seeds of two Queensland varieties; but they were received too late in the season—at least for this portion of the State—to be expected to do justice to the treatment.

It is hoped that this season (1912) will be such as to afford every opportunity for carrying out the tests under fair conditions, as both, according to their advocates, produce results which are desired by all and achieved by few.

TIMES OF SUNRISE AND SUNSET AT BRISBANE, 1912.

Date.	May.		June.		July.		August.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·31	5·0	6·40	5·3	6·30	5·18
2	6·14	5·15	6·31	5·0	6·40	5·4	6·30	5·18
3	6·15	5·14	6·32	5·0	6·40	5·4	6·29	5·19
4	6·15	5·13	6·32	5·0	6·40	5·4	6·29	5·20
5	6·16	5·13	6·33	5·0	6·40	5·4	6·28	5·20
6	6·17	5·12	6·33	5·0	6·40	5·5	6·28	5·20
7	6·17	5·12	6·34	5·0	6·40	5·5	6·27	5·21
8	6·18	5·11	6·34	4·59	6·40	5·6	6·26	5·21
9	6·18	5·10	6·35	4·59	6·39	5·6	6·25	5·22
10	6·19	5·10	6·35	4·59	6·39	5·7	6·24	5·23
11	6·19	5·9	6·35	4·59	6·39	5·7	6·23	5·23
12	6·20	5·9	6·35	4·59	6·39	5·7	6·22	5·24
13	6·20	5·8	6·36	4·59	6·39	5·8	6·21	5·25
14	6·21	5·8	6·36	4·59	6·39	5·8	6·20	5·25
15	6·21	5·7	6·36	4·59	6·39	5·9	6·19	5·26
16	6·22	5·7	6·37	4·59	6·38	5·9	6·18	5·26
17	6·22	5·6	6·37	4·59	6·38	5·10	6·17	5·26
18	6·23	5·6	6·38	5·0	6·37	5·11	6·16	5·27
19	6·24	5·5	6·38	5·0	6·37	5·11	6·16	5·27
20	6·24	5·5	6·38	5·0	6·36	5·12	6·15	5·28
21	6·25	5·4	6·38	5·0	6·36	5·12	6·14	5·28
22	6·26	5·4	6·39	5·1	6·36	5·12	6·13	5·28
23	6·26	5·3	6·39	5·1	6·35	5·13	6·12	5·29
24	6·27	5·3	6·39	5·1	6·35	5·13	6·11	5·29
25	6·27	5·2	6·39	5·1	6·34	5·14	6·10	5·30
26	6·28	5·2	6·39	5·1	6·33	5·15	6·9	5·30
27	6·28	5·1	6·40	5·2	6·33	5·15	6·8	5·30
28	6·29	5·1	6·40	5·2	6·32	5·16	6·7	5·31
29	6·29	5·1	6·40	5·2	6·32	5·16	6·6	5·31
30	6·30	5·0	6·40	5·3	6·31	5·17	6·5	5·32
31	6·30	5·0	...	...	6·31	5·17	6·4	5·32

PHASES OF THE MOON.

			H. M.
1 May	○	Full Moon	8 19 p.m.
9 „	☽	Last Quarter	7 56 „
17 „	●	New Moon	8 14 a.m.
24 „	☾	First Quarter	12 11 „
31 „	○	Full Moon	9 30 „
8 June	☽	Last Quarter	12 36 p.m.
15 „	●	New Moon	4 24 „
22 „	☾	First Quarter	6 39 a.m.
29 „	○	Full Moon	11 34 p.m.
8 July	☽	Last Quarter	2 47 a.m.
14 „	●	New Moon	11 13 p.m.
21 „	☾	First Quarter	3 18 „
29 „	○	Full Moon	2 28 „
6 Aug.	☽	Last Quarter	2 18 p.m.
13 „	●	New Moon	5 58 a.m.
20 „	☾	First Quarter	2 57 „
28 „	○	Full Moon	5 59 „

The Orchard.

THE BANANA IN QUEENSLAND.

[CONTINUED FROM JUNE NUMBER.]

APPLICATION OF FERTILISERS.

I have had frequent inquiries, not from large growers in any instance but from farmers and suburban residents, who plant from half-an-acre to a couple of perches of bananas on not too rich soil, as to what fertiliser would give the best results. This is a question which it is practically impossible to answer. It would be necessary to have an analysis of the soils in addition to information concerning the subsoil and the lay of the land, whether hilly or flat. It would manifestly not be advisable to recommend any particular fertiliser to an inquirer who simply states that he is growing Bananas, and that they do not fruit properly. Some necessary constituent of the soil may be abundant, another may be entirely absent; so that any recommendation might entail useless expense on the grower.

When, however, a whole plantation shows signs of exhaustion, it is fairly safe to presume that Bananas have been grown there continuously for many years, and that nitrogen, potash, and phosphoric acid are needed. Without an analysis of the soil, and with the above qualification, I may state, generally, that Bananas require very large amounts of potash, and if this ingredient is absent good yields of heavy bunches cannot be expected. I have already explained that the ash of the Cavendish Banana—that is to say, of the fruit—contains 66 per cent. of potash, and the leaves contain over 27 per cent. On this subject of fertilisers, I cannot do better than present to banana-growers the following résumé of reports of experiments in manuring bananas, carried out (and still in progress, June, 1912) by Mr. A. H. Benson and Mr. J. C. Brünnich, Agricultural Chemist, Department of Agriculture and Stock.

FERTILISERS FOR BANANAS.

In May, 1909, Mr. A. H. Benson, then Instructor in Fruit Culture, a man highly qualified to undertake the duty, was deputed by the Minister for Agriculture to proceed to Buderim Mountain, and select suitable sites on which Bananas were being grown for experimental work in manuring; and I may here say that, although Mr. Benson has since been appointed Director of Agriculture in Tasmania, his work has been and still is being carried on, on scientific principles, by Mr. J. C. Brünnich, Agricultural Chemist, Department of Agriculture and Stock. He found that on the mountain proper a considerable amount of experimental

manuring was being carried out by several of the growers with more or less success. Various commercial fertilisers, in addition to green crops, ploughed in, had been used with more or less beneficial results. He selected two plots of land, both of which were so exhausted that to attempt to grow Bananas on them in their then state would, he said, be to court failure. The soil, therefore, was very suitable for experiment. After consultation with the Agricultural Chemist, Mr. J. C. Brünnich, the composition of a complete manure was decided on, the same to be used as the base of all the experiments.

This manure contained the following plant foods per acre:—

80 lb. Pure Potash K_2O).

80 lb. Phosphoric Acid (P_2O_5).

40 lb. Nitrogen (N).

The Potash was given in the form of Sulphate of Potash; the Phosphoric Acid in the form of Thomas' Phosphate or Superphosphate; and the Nitrogen in the form of Nitrate of Soda, Sulphate of Ammonia, or Dried Blood.

There were two distinct series of experiments—one in which commercial fertilisers only were used, and the other in which commercial fertilisers were used to grow a leguminous crop, to be used as a manure for the Bananas. The manure used to grow these leguminous crops contained the following plant foods per acre:—

40 lb. of (K O).

40 lb. of (P_2O_5).

10 lb. of (N).

The ground having been thoroughly prepared in the manner previously detailed, the planting of Bananas was done in September, 1909; and the whole work was carried on by the growers under the personal supervision of Mr. Benson and Mr. Brünnich.

Space will not admit of minute details of the experiments, which were carefully carried out and full records of progress kept. In June, 1910, Mr. Brünnich furnished a "Progress Report," with photographs of the plants taken in May of that year. They showed that the latter had made splendid growth since January, and this clearly demonstrated what can be accomplished by deep, thorough cultivation even on exhausted lands.

At the above date, the plants were suckering and fruiting well, equally as well as those on a neighbouring plot which had not long been under cultivation.

The next report is dated 17th October, 1910, when the Bananas had been growing for eleven months, and the first bunches were just ripening. The bunches were as large as could be expected for a first crop, even from fair quality new land.

PLATE I.

BANANA MANURING EXPERIMENTS AT BUDERIM MOUNTAINS.

J. FOOTE, ESQ.

Three Months Old. Experiments A to K Cavendish Bananas.

Standard Manure in all Experiments.

K = 80 lb. K_2O = 160 lb. Sulphate of Potash.

P = 80 lb. P_2O_5 = 470 lb. Superphosphate or Thomas Phosphate.

N = 40 lb. N as 286 lb. Dried Blood; or 250 lb. Nitrate of Soda; or 200 lb. Ammonium Sulphate.

$2\left\{\begin{matrix}K\\P\\N\end{matrix}\right\}$ Means double quantities. $\frac{1}{2}\left\{\begin{matrix}K\\P\\N\end{matrix}\right\}$ Means half quantities.

$\left\{\begin{matrix}K\\P\\N\end{matrix}\right\}$ Pot. sulph. Superphosph. Dr. blood.

Cost per plant: 2¾d.

$2\left\{\begin{matrix}K\\P\\N\end{matrix}\right\}$ Pot. Sulph. Superphosph. Dr. blood.

Cost per plant: 5½d.

PLATE I.—*continued.*

$\left\{\begin{matrix}\mathrm{K}\\ \mathrm{P}\\ \mathrm{N}\end{matrix}\right\}\begin{matrix}\text{Pot. sulph.}\\ \text{Superphosph.}\\ \text{Ammon. sulph.}\end{matrix}$

Cost per plant: 2¾d.

$2\left\{\begin{matrix}\mathrm{K}\\ \mathrm{P}\\ \mathrm{N}\end{matrix}\right\}\begin{matrix}\text{Pot. sulph.}\\ \text{Superphosph.}\\ \text{Ammon. sulph.}\end{matrix}$

Cost per plant: 5⅝d.

$\left\{\begin{matrix}\mathrm{K}\\ \mathrm{P}\\ \mathrm{N}\end{matrix}\right\}\begin{matrix}\text{Pot. sulph.}\\ \text{Thomas phosph.}\\ \text{Ammon. sulph.}\end{matrix}$

Cost per plant: 2⅝d.

$\left\{\begin{matrix}\mathrm{K}\\ \mathrm{P}\\ \mathrm{N}\end{matrix}\right\}\begin{matrix}\text{Pot. sulph.}\\ \text{Superphosph.}\\ \text{Dr. blood.}\end{matrix}$

PLATE I.—*continued.*

K } Pot. sulph.
P } Thomas phosph.
N } Nitrate.

Cost per plant: 3⅛d.

K } Pot. sulph.
P } Superphosph.
N } Ammon. sulph.

Cost per plant: 2¾d.

2 { K } Pot. sulph.
P } Superphosph.
N } Ammon. sulph.

Cost per plant: 5⅝d.

K } Pot. sulph.
P } Thomas phosph.
N } Ammon. sulph.

Cost per plant: 2⅝d.

PLATE I.—*continued.*

$\frac{1}{2}\left\{\begin{array}{c}\mathbf{K}\\\mathbf{P}\\\mathbf{N}\end{array}\right\}\begin{array}{l}\text{Pot sulph.}\\\text{Supe·phosph.}\\\text{Dr. blood.}\end{array}$

Cost per plant : 1⅜d.

NO MANURE.

Nil.

$\frac{1}{2}\left\{\begin{array}{c}\mathbf{K}\\\mathbf{P}\\\mathbf{N}\end{array}\right\}\begin{array}{l}\text{Pot. sulph.}\\\text{Superphosph.}\\\text{Nitrate.}\end{array}$

Cost per plant : 1½d.

$2\left\{\begin{array}{c}\mathbf{K}\\\mathbf{P}\\\mathbf{N}\end{array}\right\}\begin{array}{l}\text{Pot. sulph.}\\\text{Thomas phosph.}\\\text{Nitrate.}\end{array}$

Cost per plant : 6¼d.

PLATE II.

BANANA MANURING EXPERIMENTS AT BUDERIM MOUNTAINS.

W. H. GUY, ESQ.

Three Months Old.

No. 1 to No. 10, Cavendish.

No. 11, Lady's Finger.

Standard Manure same as on Plate I.

$\left\{\begin{matrix} K \\ P \\ N \end{matrix}\right\}$ Pot. sulph. / Superphosph. / Dr. blood.

Cost per plant: 2¾d.

$2\left\{\begin{matrix} K \\ P \\ N \end{matrix}\right\}$ Pot. sulph. / Superphosph. / Dr. blood.

Cost per plant: 5½d

$\frac{1}{2}\left\{\begin{matrix} K \\ P \\ N \end{matrix}\right\}$ Pot. sulph. / Superphosph. / Dr. blood.

Cost per plant: 1⅜d.

PLATE II.—*continued.*

NO MANURE.

Nil.

$\frac{1}{2}\left\{\begin{array}{c}\mathbf{K}\\\mathbf{P}\\\mathbf{N}\end{array}\right\}\begin{array}{l}\text{Pot. sulph.}\\\text{Superphosph.}\\\text{Nitrate.}\end{array}$

Cost per plant: $1\frac{1}{2}$d.

$2\left\{\begin{array}{c}\mathbf{K}\\\mathbf{P}\\\mathbf{N}\end{array}\right\}\begin{array}{l}\text{Pot. sulph.}\\\text{Thomas phosph.}\\\text{Nitrate.}\end{array}$

Cost per plant: $6\frac{1}{4}$d.

$\left\{\begin{array}{c}\mathbf{K}\\\mathbf{P}\\\mathbf{N}\end{array}\right\}\begin{array}{l}\text{Pot. sulph.}\\\text{Thomas phosph.}\\\text{Nitrate.}\end{array}$

Cost per plant: $3\frac{1}{8}$d.

PLATE III.

BANANA MANURING EXPERIMENTS AT BUDERIM MOUNTAINS.

J. FOOTE, Esq.

Experiments the same as on Plate I.

Stools 7 Months Old.

$\left\{\begin{matrix}K\\P\\N\end{matrix}\right\}$

Cost: $2\frac{3}{4}$d. per stool.

$2\left\{\begin{matrix}K\\P\\N\end{matrix}\right\}$

Cost: $5\frac{1}{2}$d. per stool.

$\frac{1}{2}\left\{\begin{matrix}K\\P\\N\end{matrix}\right\}$

Cost: $1\frac{3}{8}$d. per stool.

PLATE III,—*continued.*

UNMANURED.

$\frac{1}{2}\left\{\begin{matrix}K\\P\\N\end{matrix}\right\}$

Cost: 1½d. per stool.

$2\left\{\begin{matrix}K\\P\\N\end{matrix}\right\}$

Cost: 6¼d. per stool.

$\left\{\begin{matrix}K\\P\\N\end{matrix}\right\}$

Cost: 3d. per stool.

PLATE III.—*continued.*

$\left\{\begin{matrix}K\\P\\N\end{matrix}\right\}$

Cost: 2¾d. per stool.

$2\left\{\begin{matrix}K\\P\\N\end{matrix}\right\}$

Cost: 5½d. per stool.

$\left\{\begin{matrix}K\\P\\N\end{matrix}\right\}$

Cost: 2½d. per stool.

Banana Stool, 7 Months Old, on Virgin Scrub Soil.

UNMANURED.

PLATE IV.

BANANA MANURING EXPERIMENTS AT BUDERIM MOUNTAINS.

W. H. GUY, Esq.

Experiment 1 to 10, Cavendish.

Same as Plate II.

Stools 7 Months Old

$\left\{ \begin{matrix} K \\ P \\ N \end{matrix} \right\}$

Cost: $2\frac{3}{4}$d. per stool.

$2 \left\{ \begin{matrix} K \\ P \\ N \end{matrix} \right\}$

Cost: $5\frac{1}{2}$d. per stool.

$\frac{1}{2} \left\{ \begin{matrix} K \\ P \\ N \end{matrix} \right\}$

Cost: $1\frac{3}{8}$d. per stool.

PLATE IV.—*continued.*

$\left\{ \begin{matrix} K \\ P \\ N \end{matrix} \right\}$

Cost: 2¾d. per stool.

$2 \left\{ \begin{matrix} K \\ P \\ N \end{matrix} \right\}$

Cost: 5½d. per stool.

$\left\{ \begin{matrix} K \\ P \\ N \end{matrix} \right\}$

Cost: 2½d. per stool.

Lady's Finger, 7 Months Old.

$\left\{ \begin{matrix} K \\ P \\ N \end{matrix} \right\}$

Cost: 5½d. per stool.

PLATE IV.—*continued.*

UNMANURED.

$\frac{1}{2}\left\{\begin{matrix}K\\P\\N\end{matrix}\right\}$

Cost: 1½d. per stool.

$2\left\{\begin{matrix}K\\P\\N\end{matrix}\right\}$

Cost: 6¼d. per stool.

$\left\{\begin{matrix}K\\P\\N\end{matrix}\right\}$

Cost: 3d. per stool.

The cost of the experiments per stool for fertiliser was from 1⅜d. to 6¼d., according to the manure used.

The fourth Progress Report dealt with the first harvest of fruit, which proved eminently satisfactory. The total cost of five dressings of manure amounted to about 1s. 6d. per stool, the first crop yielding, on an average of ten experiments, 92 Bananas per stool or nearly 8 dozen fruits per bunch. The actual results of the experiments were as follows:—

		Plot 1 (Foote's).					Plot 2 (Guy's).			
No. of Experiment.	Manures Applied.	Total Cost of Manure in pence per Stool.	Number of Bananas per Stool.	Dozens of Bananas per Bunch.	Number of First Bunches in Experimental Blocks.	Number of New Suckers for next Crop.	Number of Bananas.	Dozens per Bunch.	Number of First Bunches.	Number of New Suckers for next Crop.
1	KPN ... (Blood) ...	6¼	96	9	32	73	18	6	7	55
2	2 (KPN) (Blood) ...	12½	120	10	36	83	19	6½	7	66
3	½ (KPN) (Blood) ...	3⅛	76	8½	27	70 (poor)	11	4	6	47
4	Nil	...	49	5½	27	48 (v. poor)	15	6	6	44
5	½ (KPN) (Nitrate.) ...	3½	88	8	33	57 (poor)	55	7	17	56
6	2 (KPN) (Nitrate.) ...	14	101	8½	33	75	86	7¾	26	57
7	(KPN) ... (Nitrate.) ...	7⅛	94	8½	34	72	55	6½	20	54
8	(KPN) ... (Ammon.) ...	6¼	104	9¼	33	71	29	5¾	12	61
9	2 (KPN) (Ammon.) ...	12⅞	106	9½	34	70	67	7½	21	53
10	KPN ... (Ammon.) ...	5⅞	94	8¼	34	66	47	6½	17	44
	Number of Stools for each Experiment, 36.						Number of Stools for each Experiment, 26.			

NOTE.—K = 160 lb. K_2O = 320 lb. Sulphate of Potash.

P = 80 lb. P_2O_5 = 470 lb. Superphosphate or Thomas' Phosphate.

N = 40 lb. N as 286 lb. dried blood, or 250 lb. Nitrate of Soda or 200 lb. Ammonium Sulphate.

2 (KPN) means double quantities. ½ (KPN) means half quantities.

ANALYSES OF BANANA PLANTS AND FRUITS GROWN ON BUDERIM MOUNTAIN.

—	Banana Plants: Ash.						Banana Fruits: Ash.					
	Lady's Finger.		Cavendish.		Sugar.		Lady's Finger.		Cavendish.		Sugar.	
	—	Pure Ash.	—	Pure Ash.	—	Pure Ash.	—	Pure Ash.	—	Pure Ash.	—	Pure Ash.
		%		%		%		%		%		%
Weight of green plant	118 lb.	...	52 lb.	...	62 lb.	...	...	...	...	...	...	...
Weight of bunch	...	...	...	...	...	...	22 lb.	...	39 lb.	...	16 lb.	...
Approximate number of bunches per acre ...	...	...	...	...	...	...	432	...	555	...	460	...
Moisture ... ... per cent.	87·69	...	90·00	...	85·54	...	75·9	...	79·8	...	72·75	...
Dry Material ... ... per cent.	12·31	...	10·00	...	14·46	...	24·1	...	20·2	...	27·25	...
Pure Ash ... ... per cent.	1·14	...	1·31	...	1·14	...	1·18	...	·94	...	·92	...
Containing—												
Silica SiO_2	·270	23·68	·201	15·34	·245	21·49	·082	6·960	·059	6·225	·063	6·923
Iron and Alumina, $Fe_2O_3Al_2O_3$ ...	·015	1·32	·023	1·77	·021	1·88	·033	2·835	·010	1·112	·037	4·061
Manganese Oxide, MnO	·026	2·32	·023	1·77	·021	1·88	·001	·119	·002	·200	·001	·115
Lime, CaO	·219	19·24	·278	21·33	·151	13·25	·039	3·324	·020	2·125	·018	2·016
Magnesia, MgO	·064	5·66	·092	7·02	·100	8·77	·071	5·995	·056	5·925	·056	6·091
Soda, Na_2O	·050	4·44	·021	1·60	·022	2·00	·033	2·815	·018	1·880	·023	2·506
Potash, K_2O	·378	33·17	·480	36·64	·437	38·83	·734	62·350	·605	64·250	·555	60·625
Sulphuric Acid, SO_3	·007	·66	·018	1·38	·020	1·75	·017	1·445	·013	1·329	·015	1·659
Phosphoric Acid, P_2O_5	·030	2·65	·019	1·46	·040	3·52	·083	7·010	·058	6·150	·071	7·748
Chlorine, Cl	·121	10·62	·199	15·20	·103	9·10	·108	9·175	·130	13·900	·098	10·728
Nitrogen, N	·107	...	·133	...	·136	...	·212	...	·202	...	·304	...
	Lb. of Plant Food.						Lb. of Plant Food.					
	In each Plant.	In Plants per Acre.	In each Plant.	In Plants per Acre.	In each Plant.	In Plants per Acre.	In each Bunch.	In Bunches per Acre.	In each Bunch.	In Bunches per Acre.	In each Bunch.	In Bunches per Acre.
Lime, CaO	·258	154·8	·144	86·4	·093	55·8	·0086	3·73	·0079	4·37	·0029	1·36
Magnesia, MgO	·075	45·0	·048	28·8	·062	37·2	·0155	6·70	·0217	12·03	·0089	4·10
Potash, K_2O	·446	267·6	·250	150·0	·272	163·2	·1615	69·75	·2360	123·09	·0888	40·80
Phosphoric Acid, P_2O_5	·035	21·0	·010	6·0	·025	15·0	·0182	7·84	·0226	12·50	·0113	5·21
Nitrogen, N	·126	75·6	·069	41·4	·084	50·4	·0466	20·15	·0787	43·70	·0486	22·38

BANANAS AND BEES.

In a series of articles on the Banana Industry, published in "The Journal of the Board of Agriculture of British Guiana" in 1909, Mr. Stockdale (the author) mentioned, in dealing with the "Diseases of the Banana," that bees, in Surinam (Dutch Guiana) have been responsible on some estates for a very great amount of damage. At Meerzorg 12,000 to 15,000 bunches, or over 20 bunches per acre, were actually lost in 1908 by "spotting" by bees; while all the labourers had to be employed in destroying bees rather than in cultivating Bananas, so that the extent of damage was not limited to those 12,000 to 15,000 bunches. Occasionally still larger losses have been suffered through Bananas being blown down by winds, especially in exposed situations.

These various causes of loss were reported on by a Commission appointed by the Government of British Guiana to investigate the industry as carried on there, and the Committee came to the conclusion that, for these and trade reasons, no hope of or any inducement offered for the establishment of a Banana Industry in British Guiana either then or in the near future.

I have made many inquiries amongst banana-growers in Queensland as to whether bees, which are so numerous everywhere in the State, had ever been a cause of damage to Bananas, but cannot find that those busy insects have been responsible for damage to the fruit, I grew Bananas for several years here, and also kept numbers of bees, wild brown bees being very numerous also in the neighbourhood, but I never noticed that they troubled the Bananas. Why they should, in Surinam, attack the acrid skin of the Banana, or what they expected to carry thence to their hives, has not been explained to my knowledge.

A NEW STUMP-JUMP PLOUGH.

A trial was lately given at Kamarah (N.S.W.), of Mr. Clarence H. Smith's stump-jump single-jump one-way disc cultivator (says the "Farmer and Settler"). The ground was new and full of stumps, yet it turned the earth over equal to being ploughed. Six horses were used to eleven discs, and a long test was made, going for about three hours.

This is a new implement, and from telegrams received from South Australia great satisfaction is being given by it there as well as here. The jump is quite distinct from other makes, the disc going sideways, and therefore gliding over the stump; this, the maker maintains, is easier on the discs and they last longer. The springs, being for each disc, act on each separately and, directly the disc is over the stump, force it into the ground.

[Such a plough, as above described, if it does the work claimed for it, should be a valuable implement for new settlers in Queensland; and it will doubtless be introduced into this State in due course, in which case, a public demonstration would soon decide its merits.—Ed. "Q.A.J."]

Viticulture.

OBSERVATIONS AND CULTURAL NOTES ON GRAPES.—No. 7.

BY CHARLES ROSS, Instructor in Fruit Culture.

[CONTINUED.]

PLATE 2.—ROYAL ASCCT—(Bunch, one-third; berries natural size.)

33. *Waltham Cross.*—A large, oval, vinous grape. The bunches are large, beautifully tapering, with very long stalks; and the fruit sets well and evenly. Very large berries with thick skin of greenish yellow colour, changing to deeper amber when thoroughly ripe. The flesh is very firm, sweet, and crackling, but not rich. A most handsome and useful late-keeping variety. The vine is a rampant grower, but the wood does not ripen very well, often dying back in wet seasons, and is liable to spot in coastal districts. The variety is an English seedling, but is best suited to a dry, warm ridge of fairly rich, sandy or gritty loam well drained.

34. *Wortly Hall.*—A large, black, oval grape. Very large bunches heavily shouldered and closely set. The berries grow very large when properly thinned, tough skin, deep purple, carrying a heavy bloom. A good late variety, and may be marketed as soon as it is coloured; but

the flavour is rather coarse before it fully ripens, and it should be left to hang longer to bring out its true merits. The vine is strong, vigorous, hardy, prolific, and not susceptible to disease. It was raised in England, and will stand rougher treatment than most first-class table varieties.

PLATE 3.—TREBBIANO.—(Bunch, one-third; berries, natural size.

35. *Dattier de Beyrout.*—A very fine, oval, amber-coloured grape. The bunches are above average size, well set, and exceedingly handsome. Very large berries, oblong, greenish yellow, semi-transparent skin turning to rich deep amber when ripe. The juice is sweet and crackling. A late kind, hanging well into the autumn. The vine is a moderate grower, robust and healthy, but not a heavy bearer. It does best on fairly good,

well-drained soil; but it would do better inland than near the coast. It is well worthy a place in any collection for its appearance alone, as its great beauty is never excelled by any other white variety. Its name indicates a Levantine origin, whence so many striking varieties have been introduced.

PLATE 4.—GŒTHE (ROGERS' HYBRID NO. 4).

36. *Muscat of Alexandria.*—This variety has been grown under so many synonyms that one is easily confused. The well-known and largely grown "Gordo Blanco" is so very similar in all its characteristics that the difference is almost imperceptible, although it is claimed by some growers that it is more reliable in setting its berries. This has not been my experience, and I cannot vouch for it. It is commonly noticed that both close and thinly set bunches grow on the same vine. A late, oval.

white Muscat grape of first-class merit, undoubtedly the most valuable variety in cultivation. The bunches are large and tapering, but set in a very erratic manner. Very large berries, with thick greenish-yellow skin turning to rich amber, tinted with a rosy hue on the sunny side and very handsome. Its sweet, rich, crackling flesh possesses the highest Muscat flavour. The vine is vigorous and robust, often rampant on rich soil before it comes into full bearing. The bunches appear in great profusion, and, if all are left on, growth on the early summer shoots is

PLATE 5.—ELVIRA.

often retarded. This may also have the effect of the berries setting unevenly. Close winter pruning is required and topping the extra vigorous summer shoots only. One of the oldest and best of grapes. Its place of origin seems lost in obscurity. It probably was introduced from somewhere in the Levantine region in early times, and since brought to its present perfection. More suitable for inland districts, although it has been grown with moderate success near Brisbane. Specially deserves and will well repay high-class treatment.

PLATE 6.—WILDER (ROGERS' HYBRID NO. 1).

Tropical Industries.

SOME OF OUR RUBBER PLANTATIONS.

By HOWARD NEWPORT, Instructor in Tropical Agriculture.

The fact that our one tropical industry in this country that has attained any dimensions (sugar) is, from its very nature, one that requires that the plantations or farms shall be grouped (round a mill) in any given district—and which, therefore, can be readily seen in appreciable area—is very apt to induce the idea that no other industries exist since they cannot be similarly viewed.

Other tropical industries, do, however, exist, though it is true they have not attained the proportions of sugar culture as yet; but there is no reason at all why, with more or less similar treatment and attention, these should not ultimately attain similar proportions, if not in area, at least in results—that is, in the production of commodities to the approximate limit of the demand or consumption of the country.

Sugar being a bulky product, which is produced in more or less quantity in the marketable form in, of necessity, distinct centres, inter-communication between the farms, as well as between each centre and the seaport, is by rail. Hence they are easily accessible, and a considerable area may be viewed in a comparatively short time by means of the light line locomotive, on horseback, or even on foot, which, while helping the sugar industry, tends to an underrating or undervaluing by comparison of what does exist in the way of tropical agricultural industries other than sugar.

With such industries as Rubber, Coffee, Vanilla, Cocoanuts, &c. (of which plantations are by no means non-existent), not only is the area for a given return frequently less than sugar, but, a central factory for rendering the raw articles marketable not being necessary, the estates are not grouped; and it is not possible, therefore, to visit a district and in a few hours at most circumvent the whole area under the one staple in the locality. In short, the sugar industry tends to a sort of local centralisation, while most other tropical industries lead to decentralisation. Were all the Rubber, Coffee, and other such estates grouped, no doubt the locality would be more visited and consequently that industry or staple better advertised.

Again, the products of Rubber, Coffee, Copra, and Vanilla, as well as being generally less perishable, are so valuable per bulk (Rubber, about £520 per ton; Coffee, £70 to £100 per ton; Copra, £24 per ton; and Vanilla Beans up to 20s. per lb.) that they are able the better to overcome difficulties in the way of more costly methods of transport. Hence they may be and are grown in the more outlying and, therefore,

more isolated localities. Considered rightly, these points stand to their credit since they tend to induce settlement in the more unoccupied areas; but by their very virtues do they suffer, for combination among producers is almost impossible of attainment, and a group of rubber or coffee growers can practically never be met with, either to be addressed or to attract the attention of visitors and newcomers; and, therefore, the encouragement of publicity, attention, and advertisement, as well as the attraction to others to engage in similar interesting as well as remunerative occupations, is lacking. It is their lot to be virtually ignored—because seldom seen and little heard of.

As from their nature these isolated estates cannot be brought before the public, the authorities, or the newcomers, the industries suffer by the relative importance not being brought home to one of the part they are really playing in the whole settlement of the tropical areas during their infancy and inauguration.

"To him that hath shall be given" is an old saying; and no doubt the more the small industries grow the more attention they will attract, and the more they will be encouraged and enabled to grow. Meanwhile it is but to be expected that progress will be slow. As soon as there are enough growers in any one locality to invite members of the Government and the public generally, as well as the intending or prospective settlers, to inspect and view their efforts and successes, to address them and be entertained by them, so soon will the strides of progress become longer and faster.

Each new settler, therefore, who takes up, whether wholly or in part, any of these staples should be of special interest to all other growers as being at this stage a by no means negligible factor in their own stability and progress. As such he is worthy of their encouragement, advice, and assistance, and his success, if it be possible, should be welcomed. Generally, growers of the same staple are only too pleased to exchange ideas on matters of such mutual concern and interest, and to "talk shop" whenever they meet; but, to again compare the growing of these products with the growing of sugar, the information a new grower of sugar-cane can obtain by walking into the next paddock, the rubber or coffee grower may have to spend much time and travel far to obtain. Similarly, therefore, as the various tropical industries other than sugar suffer collectively by want of public attention to them through their being individually separated or isolated, so also do the growers themselves suffer by being unable to discuss points of culture and compare results and exchange ideas between themselves. Hence it is thought that the little collection of snap-shots, taken during the past few months, of some of our Northern Queensland Rubber Plantations, young and small though they may be, will prove of interest not only to those who did not, perhaps, know that such existed, or those who may be watching with intent and interest the first efforts of this industry, but also to the growers themselves for purposes of comparison, &c., and also, it is hoped, may help to expedite the time when greater strides and quicker progress may be looked for.

That Pará Rubber will thrive in Queensland has long ere this been amply demonstrated. Indeed, the growth of the trees has proved quite equal, on the average, to any other country where it is being cultivated. Also, the value of Bananas as a catch crop for Rubber—or Rubber as an ultimate crop for land under Bananas, whichever way it may be taken—has been amply and successfully demonstrated. According to the usual method of Banana cultivation in North Queensland, the suckers are planted out about 12 ft. by 12 ft. in soil and in situations that are just what the Pará Rubber requires. The Bananas commence bearing in eight to twelve months, and continue for five or six years, by which time the stools require replanting, when advantage is often taken of the opportunity to open new land, and the old field is abandoned.

Meanwhile, if Rubber has been planted, the shade and cultivation afforded by and to the Bananas is all that the young Rubber plants need; and by the time the Bananas are considered worked out their place is automatically taken by the Rubber, which is by then just about ready to tap. Instead, therefore, of a useless field, that would soon become a nursery of undergrowth and noxious weeds, there stands a valuable plantation at a minimum of expenditure; while the otherwise irksome period of waiting for returns has been overcome by means of the Banana crops, and has been hardly felt, if felt at all.

The areas in these Queensland plantations may strike anyone accustomed to eastern tropical plantations as being small, but it must be borne in mind that these are what may be called "one-man" plantations where the owner has generally to do all the work; also, that, where the trees will produce 12s. to 15s. worth of rubber a year, the return from even an acre is appreciable.

Fig. 1 is a plantation near Cairns—to be precise, at Hambledon Junction—a small area of about 1½ acres planted by Mrs. Dr. Koch, of Cairns. The trees were about fifteen months old when photographed, which was at the very driest time of a dry season, the earlier part of which included two cyclonic blows and a flood. The bananas had suffered severely, but the rubber-trees not merely survived, but were growing and forming new leaf at the time, indicating that they had rooted deeply and well. In fact, this little plantation, which can be seen by travellers on the Cairns-Mulgrave Tramway, recently taken over by the Government, is an excellent object lesson of the hardiness of the *Hevea braziliensis* in our soils and climate.

No. 2 is a plantation of some 5 or 6 acres on the Little Mulgrave River, near Nelson. The photo. is taken from some distance to include one or two year-old trees.

No. 3 is another very fine little plantation at Clyde, near Babinda, and opened by Mr. W. J. Hanneysee. At present some 6 acres are planted about 15 ft. apart, and no catch crops are underweigh, though some are contemplated. A few two-year-old trees exist, which have grown well, though some are bent owing to the recent cyclone. Against one of these the proprietor is standing.

There is often ample space for many such permanent economic staples on ordinary farms in headlands, spare spaces, gullies, and odd corners.

Fig. 4 shows some trees doing very well on a sugar farm at Palma, on the same line, several hundreds of which have been planted round the headlands. These suffered last year to some extent, when small, from the smoke and heat of burning trash, but were not materially damaged, and, from now on, should suffer very little even from this ordeal.

No. 5 is a plantation on the Murray River, the port for which is Cardwell. Here the trees, which are four and a-half years old, may be seen replacing the bananas among which they were planted. This estate consists of some 2,000 trees or more of various ages.

No. 6 depicts another portion of the same plantation with a specimen of an eighteen-month Pará tree among young bananas.

No. 10 is one of the trees from the field shown in No. 5 wherein the size of the tree may be judged, and which, it must be admitted, is very satisfactory for its age. The estate is being enthusiastically worked by the planter, Mr. Brice Henry.

Nearer Cardwell is another plantation which, if smaller, is, if possible, even more satisfactory. Mr. P. T. Hogg has here planted his rubber and bananas (largely Gros Michel) together. A few hundred trees are two years old, and are sturdy and healthy, as shown in Figs. 8 and 9; but the younger clearings appearing in Fig. 7 show fine young trees 2 in. or more in diameter and 12 ft. high at an age of eleven months only, which will be found to compare well with similar aged trees in any country.

Figs. 11 and 12 are from an estate of some 3,000 trees on the South Johnstone River, near Innisfail. These were planted some four and a-half years ago, but, unfortunately, the bananas were then two years old, so that while the cultivation of the bananas is being now given up the rubber-trees are not yet quite big enough to tap. Still, the way in which the rubber is replacing the bananas is clearly shown in Fig. 11. The trolley lines are of wood, and were for the transport of the bananas. The growth of the trees is somewhat uneven in this plantation, but many are of good size, as may be judged by Fig, 12, and some returns are anticipated next year.

It is hoped that another series of similar snap-shots will be available shortly.

[The above most interesting paper on the incipient rubber plantations of North Queensland contains information totally new to the general public, and should do good service in drawing attention to the suitability of the Northern Coast Lands for Rubber-growing, and to the comparative ease with which plantations can be formed, whilst at the same time the planter is enjoying the revenue from other crops whose place will eventually be taken by the rubber trees. Mr. Newport, by his paper, has done more, we consider, to excite interest in and increase the

Fig. 1.

Fig. 2.

PLATE 7.—SOME OF OUR RUBBER PLANTATIONS.

(*See Letterpress.*)

Fig. 3.

Fig. 4.

PLATE 8.—SOME OF OUR RUBBER PLANTATIONS.

(*See Letterpress.*)

Fig. 5.

Fig. 6.

PLATE 9.—SOME OF OUR RUBBER PLANTATIONS.
(*See Letterpress.*)

Fig. 7.

Fig. 8.

PLATE 10.—SOME OF OUR RUBBER PLANTATIONS.
(See Letterpress.)

Fig. 9.

Fig. 10.

PLATE 11.—SOME OF OUR RUBBER PLANTATIONS.

(See Letterpress.)

Fig. 11.

Fig 12.

PLATE 12.—SOME OF OUR RUBBER PLANTATIONS.

(*See Letterpress.*)

area under rubber than could have been attained by any long scientific publication on the subject, such papers as the latter only appealing to big companies, and, unlike the above, conveying little of interest to the small farmer. We advise all who are engaged in banana cultivation in North Queensland to carefully read and act upon the information and advice given in Mr. Newport's paper. Last month we paid a visit to the Kamerunga State Nursery, and were shown some 300 well-grown young Pará rubber trees planted between the bananas. These are all fine healthy trees, which give promise of becoming a valuable asset in due course.—Ed. "Q.A.J."]

RUBBER VARIETIES.

We take the following notes on some varieties of rubber trees from a pamphlet on rubber-planting lately published in Sydney by Mr. T. Binnie, of Papua, who has had a large experience of rubber-planting in Ceylon and other rubber-producing countries. After treating of the methods of sowing the seed, forming the nursery, transplanting, &c., he proceeds:—

As in a country with such varied conditions of climate and soil as Papua, while one variety of rubber may suit certain districts, in others most likely it would be an utter failure, and while in the east comparatively little is known about rubber cultivation and the results to be obtained from such cultivation, in Papua we may say there is nothing known on these points.

Of course in an article of this sort it will be impossible to go into all varieties, so I will confine myself to the best known, and those of which I have had personal experience:—

PARA (*HEVEA BRAZILIENSIS*).

This rubber I take first as, owing to the care taken in the collecting, preparation, and placing on the market, it has been made a standard of the market, and all rubbers are graded according to this standard.

Of the genus Hevea there are said to be fourteen lactiforous species, the most valuable being *H. Braziliensis*. This genus has its headquarters in Brazil, but extends to the adjoining territories of Bolivia, Peru, Venezuela, and Guiana. It is the most abundant and best-known of all rubber-yielding plants.

Pará does best where the temperature does not go below 65 degrees, and the rainfall is from 70 in. to 150 in. per annum, and the wind should seldom exceed a velocity of 20 miles an hour, and it should not be planted at a greater altitude than 200 ft.

Flat, low land was originally preferred for rubber plantations, but rubber does equally well in rolling or hilly country. My experience is that, while in the alluvial soils along the banks of rivers, even below flood level, which I believe are the conditions of the Amazon Valley, Pará will do well, better results are obtained on the ridges, provided the soil is good and rainfall adequate.

Sandy soil is unsuitable, while rocky soil is generally favourable.

I have seen "alalang" land successfully planted with Pará, but the land was well ploughed and harrowed first. Lalang soils are usually inferior from a chemical and physical standpoint, though in most cases the growth of the rubber trees appeared to be satisfactory. Such soils usually show a small percentage of organic matter, potash, phosphoric acid, and lime; but ploughing in of green nitrogenous manures and the addition of lime will soon alter this, and perhaps make the land equal to good scrub land. The young trees are planted in rows, but the distance between the trees and between the rows varies a great deal on different plantations. There is a difference of opinion on this point, but it is generally considered that planting closer than 200 trees per acre is a failure.

A great deal of planting at the present time is in avenues.

In Ceylon most planting now being done is in avenues 20 ft. wide, the trees being 15 ft. apart. They are planted so that the avenues run east and west. This gives the sun a chance to shine on the soil. In Malaya most planting is now being done 12 by 24, or 148 to the acre. Some planting is being done 15 by 30, or 96 per acre. One plantation I saw was planting in equilateral triangles, the trees being 17½ ft. apart, or 160 per acre, as against planting in rectangles 17½ by 17½, which would only give 140 per acre.

Pará grows in two forms, one more bushy than the other. Most planters prefer a tree fairly branched. In most places, in order to make the tree branch at a desired height, thumb-nail pruning is resorted to. This also has a tendency to make the tree large at the base. If a tree branches at 10 ft. or 15 ft. from the ground it is about right. Many planters who have "topped" their trees state, however, that it results in two large branches forming, which is apt to split the trunk where the branches meet if the wind is strong. The more leaf, however, a tree has, the better and the quicker will the bark "respond."

The question of how close or how far apart the trees should be planted is one that has had a great deal of attention, and is of vital importance, and it is necessary to consider conditions as they are likely to exist in the future.

Pará, having a thicker bark than Ceara, is much easier to tap; it gives a good flow of latex, which is easily cured by smoke; the seeds, however, are very difficult to germinate, and it does not grow easily from cuttings, and must have good land and a regular rainfall.

CEARA RUBBER (*MANIHOT GLAZIOVII*).

This species was obtained from the province of Ceara by Mr. Cross, and distributed to the West Indies, India, Ceylon, Africa, and the Straits, about the year 1877.

Most of the remarks in reference to Pará apply also to Ceara, with some important exceptions; and it should not be forgotten that this rubber, when well prepared, obtains the highest price.

It grows best in dry tropical countries, on the poorest soils, and if it can be successfully cultivated it will have to be reckoned with as a rubber of the finest grade.

Formerly Ceara rubber appeared on the market in the form of "scrap," being coagulated on the trees by natural heat in tears or strips, and subsequently collected and rolled into balls. In this scrappy and impure condition its value naturally depreciated, but the rubber now prepared in India, Ceylon, and German East Africa is valued at about the same as the best plantation Pará.

I have seen Ceara trees growing at an altitude of 3,000 ft. above the level of the sea. Ceara can be planted where the temperature goes as low as 45 degrees, but a temperature above 50 degrees is preferred. As to rainfall, Ceara does best where there is 50 in. to 120 in. of rain per annum. The best Ceara I have seen was in a district where the rainfall is only 60 in. per annum. The trees will grow in rainier districts, however; but tapping is not so successful as in drier districts.

The Ceara rubber tree is a great drought-resister, and will grow on almost any kind of soil. In Brazil, where the trees were first found, and in the dry province of Ceara, Ceara trees are said to flourish on a sandy and rocky soil, with very little rain. This, however, does not mean that the tree will not thrive on a rich soil with plenty of rain. From experiments made by myself in the Philippines, I am satisfied that on a rich soil with plenty of rain, the trees will grow to be from 8 in. to 12 in. in diameter in three years, and will produce a large amount of rubber of excellent quality. It is generally claimed that a well-drained soil is essential to the welfare of Ceara rubber. I do not believe it will grow in swamps, but I do know that it will get along nicely on perfectly flat land with very poor drainage. I had on the plantation I was managing in the Philippines a number of two-year-old trees which I planted on well-ploughed land on which hemp was planted at the same time. One end of this plot of land had a very poor drainage; the water in the rainy season would stand there at times from two weeks to a month, and the soil was so loose that it would not stand walking on without sinking down to the ankle. The hemp on this piece of land never did thrive well, and most of it died out altogether. I also planted a few Pará seedlings on this land, and, although they are growing, they were nothing in comparison to the others I planted on higher and well-drained ground; but the Ceara rubber trees were flourishing, and did not seem to mind having wet feet for a month at a time—in fact, some of these trees were larger and better shaped than the parent trees from which I selected the seeds.

The following extract from the "Queensland Agricultural Journal" fully bears me out in my advocacy for a fair trial for Ceara rubber:—

"The latest information on this class of rubber is given in a letter to the 'Rubber World,' by Mr. J. S. Low, who is practically experienced in its cultivation and production. He says:—

"'From practical experience with *Manihot Glaziovii* trees in German East Africa, where it is known that the plantations are the largest

and best in East Africa, this being proved by the great number of planters from British East Africa visiting German territory to see and learn how the trees are planted and treated, I am able to state that in East Africa and elsewhere the trees are indestructible within, of course, reasonable limits, assuming, that is, moderate and careful tapping, and keeping the bark clean, &c.

"On experimental tappings of trees ranging from two to three years, and of girths from 11 in. to 18 in., the following results were obtained from the first tappings:—

2 Trees of two and a-half years, 12 in. and 13 in. girth, gave 4 grams wet rubber.

1 Tree of two and a-half years, 14 in. girth, gave 12 grams wet rubber.

2 Trees of two and a-half years, 15 in. and 17 in. girth, gave 24 grams wet rubber.

3 Trees of two and a-half years, 11 in., 15 in., 18 in. girth, gave 31 grams wet rubber.

Total, 71 grams wet rubber.

Note.—28 grams to 1 oz.

Or an average of nearly 9 grams per tree wet rubber."

The first tapping of ninety-one larger trees of two and a-half to three years old gave 3 lb. wet rubber, or nearly ½ oz. per tree. In another instance seventy-five trees, also from the first tapping, gave 2 lb. ½ oz., or somewhat under ½ oz. per tree wet rubber, and this in a district where the rainfall is only 56 in. in the year, and where in the dry season most of the leaves were off the trees.

These trees can be tapped at the very least two or three times per week without in any way injuring them, so long as reasonable care is taken, and they are known to give more latex at the second and subsequent tappings. In a district where the rainfall is greater, nearly double the amount of latex would be obtained. From these dry-weather experiments it will be seen that the lowest possible average from one well-grown tree just ready for tapping is fully 10 grams wet rubber per tree, and at the lowest rate of tapping—*i.e.*, twice a week—this works out at 1,040 grams, or about 37 oz. of wet rubber per tree per annum, which after deducting 30 per cent. for moisture, leaves 26 oz. of dry rubber per tree.

In the old plantations a great number of the trees are from nine to thirteen years old, and still producing latex in large quantities. Ceara trees (*Manihot Glaziovii* and *M. Dichotoma*) yield, for their size and age, far more latex in proportion than the Pará (Hevea) trees. As an example of the wonderful hardiness of these, it may be mentioned that trees are to be met with that have been damaged by being broken off from the ravages of white ants and other causes to within 2 ft. or 3 ft. of the ground, putting out a new shoot from the side of the stump and forming an entirely new tree. In cases of this sort, of course, the actual roots have not been damaged.

Ceara rubber, or Manicoba, known as *Manihot Glaziovii,* belongs to the Spurge order, and is a very close relation to the Cassava plant, from which tapioca is made, and thrives best in deep, loamy soil. These notes are given with a view of contradicting reports that have been spread to the effect that the life and hardiness were not all that could be desired.

In a Brazilian report I read: "*Manihot Glaziovii* produces a rubber more pure even than Pará. There are plantations in the State of Bahia, where 676 trees per acre are dealt with and return 1,490 lb. of rubber per annum. This is, of course, in their native soil and climate, and where the country is at times flooded for months at a time. Instead of injuring the trees, the floods add considerably to their growth and yield of latex."

At the beginning of this century the export of rubber from the State of Bahia had increased more than tenfold within six years, having risen from 100 tons of very inferior rubber in 1900 to over 1,100 tons of a very superior grade of rubber in 1906. This lead to an investigation of the source of this new supply and the discovery that, instead of the low grade of Mangebeira, formerly gathered, the supply came mainly from three new and valuable varieties:—

1. *Manihot dichotoma,* or Jiquie Manicoba;
2. *Manihot heptaphylla,* or San Francisco Manicoba;
3. *Manihot Piauhyensis,* or Piauhy Manicoba.

All of these species, from all accounts, not only yield considerably more latex than Ceara, but, what is of much more importance to Papua, the amount which one man can collect is much greater; in other words, the cost of collection is considerably less.

A notable fact in this connection—one which will appeal to any one who has had any experience in the tapping of Ceara—is that in these new varieties, in shedding the bark, longitudinal slits are formed and the membranous bark peels off in more or less vertical rows. This allows its removal much more easily and therefore more cheaply than is the case with Ceara.

These varieties of Manihot, like the Ceara, have a very dry habitat.

In regard to these three varieties:—

(1) *MANIHOT DICHOTOMA.*

The seeds of this variety are very much larger than those of the Ceara. Germination takes place in two or three weeks if unfilled, the shell being much softer than in the case of Ceara. The soil upon which this tree flourishes is variously described as red clay and red loam. The bark of this tree is thinner and more delicate than that of the Ceara.

(2) AND (3) *MANIHOT HEPTAPHYLLA* AND *MANIHOT PIAUHYENSIS.*

The seeds of these two varieties can hardly be distinguished from each other; they are only a little larger than the Ceara seeds. They do not germinate nearly as well as in the case of the *Manihot dichotoma.*

These two varieties in the region round Bahia thrive in a sandy soil, growing largely on sandstone mountains. Neither of these varieties grow as tall as the *Manihot dichotoma*; they are also smaller and inclined to branch low. They are not affected by the wind so much as the Ceara, probably on account of being smaller and more low-lying. This also affects the methods of tapping. The foliage is characteristically green and fresh looking.

There are a number of plantations around Bahia, some of which are now four years old. They are planted for the most part 1,000 trees to the acre. This planting has been adopted because the trees are planted in a dry locality, and it is claimed that if not planted so closely, or say 200 to the acre, the ground would be baked hard and be so dry that the trees would dwindle and die; also the trees are considerably smaller than the other varieties, and consequently need less room.

The yield of the trees is variously stated to be all the way from 2 lb. to 11 lb. per year.

Dr. Ule considers that the *Manihot dichotoma* has the advantage of its caoutchouc, bringing a somewhat higher price. On the other hand, the amount produced in the other varieties is considerably greater, according to him. He therefore prefers these latter varieties, which he considers will supplant the Ceara for the dry and less fertile areas where the Ceara is cultivated. There is no doubt, however, that all these varieties yield more than the Ceara.

Dr. Ule says: "If, as is probable, the cultivation of Pará will undoubtedly obtain the greatest importance for the production of rubber in luxuriant tropical regions, the future has to look to *Manihot Heptaphylla* and *Manihot Piauhyensis* as the rubber plants for the dry and less fertile areas."

Of course, it is only fair to say that other observers speak as highly of *Manihot dichotoma,* whch he has left out of his statement.

To sum up, then, there are several reasons why the planters of Papua sould direct their attention to these varieties:—

(1) In the first place, the industry here is in its infancy, and we should endeavour to test all the different varieties of rubber-yielding trees which seem to promise well, for we do not know yet which species will prove the best in the long run, all things considered, such as early yield with constant tapping, amount of yield, cheapness of collection, quality of rubber obtained, &c., a balancing of all of which will give us finally the best species to cultivate most largely. The present plantations must necessarily do a great deal of pioneer work in this line, if we consider the industry for the territory as a whole. After the present companies have shown what can be done commercially with the different species, no doubt many plantations will follow this lead.

(2) These varieties in their habitat yield larger quantities than the Ceara, and yet thrive under similar or severer conditions to those in which the Ceara thrives.

(3) Most important of all here are the varieties which promise the lowest cost of collection, which, quality being equal, is, as I have said, the pivotal point in regard to the whole industry in Papua.

Ficus is an extensive old-world genus, but only a few of the many species produce rubber of commercial value. *Ficus elastica* (Rambong or Assam rubber) is the most valuable species, and is now cultivated in India, Ceylon, British Malaya, Java, and Sumatra, but not nearly as extensively as was expected a few years ago, possibly due to higher price obtained for Pará rubber and its more regular yield of latex. In Java and Borneo, however, the Dutch are planting it extensively, and it is estimated that in Java and Sumatra alone there are over 400,000 acres under *Ficus elastica,* and the Dutch planters in these islands are as scientific agriculturists as there are in the world, and they have proved at exhibitions in Malaya they can produce an article equal to the best hard Pará.

Ficus elastica is one of the earliest known of Asiatic rubbers, and was first brought to notice by Dr. Roxburgh over a century ago. In the wild state the plant is epiphytic, growing on other trees or rocks, and appears as a small crown or crest of short branches on long, rambling aerial roots. Under cultivation it is grown as an arborescent tree, and develops stout lateral branches and a consequent larger area of bark for tapping. On most of the estates in the Netherlands Indies the aerial roots are pruned off and the tree is cultivated as a standard—*i.e.,* a bushy crown and large main stem.

In habit there are marked varietal types of this species:—

(1) The Assam type has a straggling habit with pale-green, rather long, narrow leaves and the yield of latex is only moderate.

(2) The Malayan type is of compact habit with large green leaves (on young trees) and brilliant coloured stipules. The yield of latex is considerable, provided the period of recuperation is a lengthy one.

(3) The Sumatra type resembles the Malayan plant, but is more ornamental in form. The leaves are deep, shining green and more elliptic, and like its Malayan brother, the yield of latex is large if not tapped too frequently.

Formerly Rambong rubber appeared on the market in scrap form only, as the bulk of it does at the present time; but producers are now taking greater pains in their preparation, with the result that in many instances they are getting top prices for their rubber.

The yields of dry rubber from Rambong are larger than from Pará.

There are some good specimens of Rambong at and in the district around Samarai, which are well grown, and on tapping give an excellent flow of latex; and it seems to me that district is well suited for this plant.

Castilloa elastica is a native of Central America, including Mexico, Guatemala, Nicaragua, Panama, Honduras, and parts of Colombia, and

when fully grown is the largest of all rubber trees. Owing to excessive tapping and very often felling, most of the large indigenous trees have been exterminated; but a considerable area in Mexico, estimated at over 100,000 acres, is already under cultivation—a fact which must not be lost sight of in considering the future prospects of the rubber market. In the West Indies, too, cultivated Castilloa is a rubber which it is expected will be heard of in the future. On one plantation in the southern portion of the Island of Mindanoa, P.I., where I was frequently a visitor, they had a large area under Castilloa, and the owner informed me that after experimenting with Pará, Ceara, and Castilloa he was quite satisfied that Castilloa was the rubber for his district, which had a climate very similar to that of Samarai.

The nerve or tensile strength of Castilloa is not so good as that of Pará, and the rubber has never obtained so high a price.

Funtumia elastica (Lagos silk rubber) was first reported from Lagos in 1894. It is widely distributed on the west coast, and is also abundant in Uganda. Unlike the climbing Landolphias, to which Funtumia is allied, this species forms a medium-sized tree, and admits of easy cultivation. Its discovery has compensated the African output for the loss of Landolphia rubbers through excessive tapping. Improved methods of preparation are being carried out in Africa, but much of the trade rubber is prepared by boiling, a method open to objection; and the market price of such rubber is about 2s. 8d., with fine hard Pará at 4s. 6½d.

One might go on indefinitely naming rubber-producing trees, but I think these cultivatable rubbers will suffice; and I will finish this article by giving a description of a very low-grade rubber mostly procured in Borneo and Sumatra, because the latex of the breadfruit palm appears to me to very closely resemble it, and, while the English market does not take it, still 10,000 tons are shipped annually from Singapore to America and Germany, presumably to mix with other rubbers.

I speak of *Dyera costulata* (Getah jelutong), which is a well-known tree in all parts of Malaya. It is a gigantic tree, much larger than Castilloa. Although the latex contains only a small percentage of caoutchouc (about 5 per cent.), a large tree is capable of producing a great amount of latex—reports place the weight at from 2 to 3 cwt.

Dr. Werner Esch, a noted authority on manufactured rubber, wrote the following when rubber was very much cheaper than it is now:—

"To-day Pará rubber has had to be abandoned so far as the manufacture of a considerable part of our India rubber goods is concerned, and its place has been taken by cheaper rubbers. We have to renounce to a great extent the easy workable Pará rubber, and to condescend to take up the wearisome study of the methods of treatment of 'guayule.' Many have been unsuccessful herein on account of inability to fit themselves into the new conditions and surroundings."

Jelutong rubber is used in Germany for compoundings and fillings, as with low-priced goods the best rubbers are prohibited and with some other goods it is claimed that the article is improved by such adulteration.

Owing to its poor grade and low price obtained for jelutong rubber, its cultivation does not attract private enterprise, but, considering the demand, the importance of this rubber is worthy of attention.

In Malaya, jelutong grows readily anywhere from naturally sown seeds. These are produced on tall trees, and are difficult to collect, as, when the capsule bursts, the seeds, which are flat and thin, are apt to be blown away.

THE SOYA BEAN AND ITS USES.

By E. H. HERON, M.H.A.C.

(*From Cope's Planting Leaflets.*)

For the following reasons the Soya Bean has, during the last few years, risen from comparative insignificance in European countries to a product of great importance. The beans contain a high percentage of oil which can be used largely in the manufacture of soap. The residue is used in the manufacture of cattle cake and meal. As a fodder plant it is rich in nitrogen, albuminoids, and fat, and is fed in the green state as hay and silage; also, it possesses the virtue of enriching the soil in nitrogenous compounds by means of its root nodules and thereby improving and rejuvenating the soil for succeeding crops, such as maize and others, and also for cocoanut plantations.

Over 500,000 tons of Soya Bean seed were imported into Europe from Manchuria in 1910.

The Soya Bean is a leguminous plant, native of South Eastern Asia. It is supposed that it originally occurred in the wild state in the region embracing Cochin China to the south of Japan and Java. It has been cultivated from very ancient times as a food plant, principally in China and Japan; but, although grown in these countries for such an extended period, its cultivation seems to have spread very slowly to the surrounding countries. It has only been introduced into India during comparatively modern times.

This bean has begun to be extensively grown in the southern part of the U.S.A., where numerous experiments are being carried out to ascertain the varieties best suited to the different soils and climates. It is also grown in various parts of Europe, but not to any great extent.

The Soya Bean is an erect annual plant with branching hairy stems, trifoliate, more or less hairy leaves, flowers pale lilac or violet coloured and broad, three to five seeded pods covered like the stem with stiff hairs. The seeds vary in colours from whitish and yellowish to green, brown, and black, and in shape from spherical to elliptical and more or less compressed.

Under favourable conditions the plant may reach a height of 4 ft. or more; it bears prolifically. In experiments very often more than 100

pods have been obtained from one plant, but in a field crop a good average would be forty. The flowers are self-pollinated, which makes the yield entirely independent of insects and renders the plant free from an important obstacle in the way of introduction to new regions. A crop of seed is ensured wherever conditions are such as to allow the plants to make the proper vegetative growth and reach maturity.

VARIETIES.

There are over 200 varieties of Soya Bean which are distinguished according to the colour, size, and shape of the seed, and the time required for the plants to reach maturity. This large number of varieties can be formed into six groups—yellow, greenish yellow, black, brown, green, and white.

THE YELLOW.

The yellow is one of the best varieties to grow. It has the largest growth of all the Soya Beans; it is rich in oil (17 to 19 per cent.), albuminoids, carbohydrates, and nitrogen. Under average conditions it will grow from 3 to 5 ft., depending principally on the character of the soil. Ordinarily it requires from 120 to 150 days to mature a crop of seed. The average yield ought to be, on fairly good soil, 30 bushels per acre (600 kilograms). It is a most exacting variety about the depth of planting, and under no circumstances should the seed be planted more than 2 in. deep. The habit of growth is such that it can be readily harvested with machinery, and it is frequently gathered with a grain binder. One of the yellow varieties known as "Southern" has given very good results in Natal and also in the Northern Transvaal. This variety should grow well on the East Coast of Africa. The yellow varieties are most favoured by all the European burghers.

THE GREENISH-YELLOW.

Vigorous though not coarse, a medium late variety, growing 3 to 4 ft. high with numerous branches, but none close to the ground. It can be easily harvested with machinery, and is a good seed-producer.

THE BLACK.

This bean requires a very long season in which to make its full development, and is therefore adapted only to the cotton belt. The seed is rather small, elongated, and flat, and is covered with a powdery bloom which makes it look dusty. The plants grow from 4 to 6 ft. high, but have fine stems, and so are useful for hay. It contains 16.80 per cent. of oil. After all the oil has been extracted, the residue is used in large quantities by the Chinese and Japanese, who make a favourite condiment called "Shoja"—soy sauce—which is of a darkish-brown colour and is largely exported to Europe for sauce-making purposes.

THE BROWN.

This variety is excellent for hay, as it is tall and has fine stems and branches. It gives a large yield of seed, but its tall habit often makes it inclined to fall. It matures in 110 days. The seeds are large and break easily on threshing.

THE GREEN.

This grows very extensively in North China, and is considered one of their best eating beans, containing about 17 per cent. of oil. The seed is kidney shaped, green throughout, and much larger in size than any other variety. It is very coarse, matures in ninety days, and grows about 3 ft. high.

THE WHITE.

This variety grows abundantly in China, Darjeeling, Himalaya Mountains, and in India is known as "Glycine Soja-Bhat." It is one of the staple foods of both countries, and contains about 16.60 per cent. of oil.

SOIL.

In Japan the Soya Bean grows well in soil of rather strong character; while in Europe and America it has done well on comparatively light soils, often giving an abundant crop on soils too poor to grow clover. Good results have been obtained in Europe and America on a great variety of soils. In South Carolina the Soya Bean gives excellent crops on sandy limestone or marly soils, also on drained swamps that have been well marled. Experiments in both Europe and America show that the Soya Bean possesses excellent drought-resisting qualities, enduring dry weather much better than ordinary field or garden beans. As a general thing it is not easily injured by light frosts, and hence it can be planted early in the spring or can be left in the field late in the autumn.

While the Soya Bean is possessed of excellent drought-resisting qualities, it, at the same time, seems to be able to survive a period of excess of moisture better than cowpeas or even maize.

The Soya Bean is especially adapted to the maize and cotton belts, where the later varieties grow exceptionally well. Generally speaking, the Soya Bean requires the same temperature as maize; the soil requirements being much the same, it will make a good growth on poorer soil than maize requires, provided that inoculation is present. The Soya Bean makes the best development on fairly fertile loams and clays. The yellow variety also succeeds well on sandy soils.

On very rich soils all varieties are apt to make a large plant growth and a comparatively poor yield of seed, and in the poorer soils a small plant growth with a relatively large seed yield.

METHODS OF CULTURE.

In a general way the same methods of culture may be recommended for the Soya Bean as would be given to the ordinary field beans. The soil should be well prepared so as to afford a good root bed, and should be left smooth and free from clods in order to facilitate the cultivation and harvesting of the crop. Under ordinary conditions it is not likely that there will be any necessity for using any nitrogenous fertiliser, as sufficient nitrogen is usually present in the soil, and, like other legumes, this plant assimilates the free nitrogen of the air. Although the Soya Bean may be planted quite early in the season, the best results will be obtained if the sowing is put off until the ground has become thoroughly warm. A good practice is to drill the beans in

between the rows of maize after the last cultivation or tilling. If the soil is good and a crop of hay or green fodder is desired, good results may be obtained by sowing broadcast. If, however, a crop of beans is desired, it is best to plant in drills from 2 to 3 ft. apart, according to the quality of the soil. The cultivation of Soya Beans is a very simple matter unless conditions are very unfavourable; the seedling plants appear above the ground in a week, and horse hoe cultivation may then begin. Flat cultivation is preferable because if the rows are hilled harvesting cannot be done easily. The Soya Bean can be planted any time from early spring up to midsummer. Generally, early plantings require more time to mature than late plantings, the difference in the same variety often amounting to as much as three weeks.

QUANTITY OF SEED SOWN PER ACRE.

There is a great difference in the amount of seed sown per acre in the various regions. Some farmers sow only half a bushel per acre, whilst others prefer one bushel. It all depends upon the method of sowing and the character of the soil. When sown broadcast, about a bushel of seed is required, and when put in with a drill, from half to three-quarters of a bushel is required. When a seed crop is required, enough seed should be used to give five or six plants per foot in the row, the rows being on an average 2½ ft. apart. It is best to cultivate the beans soon after planting—first of all with a horsehoe to keep down the weeds and retain the moisture. If sown broadcast, very little cultivation is necessary except at first, as the bean plants will soon smother the weeds. When a crop is drilled in for seed, a shallow and frequent cultivation is necessary to obtain the best results, but it need not be continued after the plants shade the soil. As a rule, the crop will require a smaller amount of cultivation than maize.

THE INOCULATION OF SOYA BEANS.

Like other legumes, the Soya Bean is able to utilise the nitrogen of the air and add it to the soil by means of root nodules. These nodules are caused by certain bacteria; unless they are present, Soya Beans in the usual types of soil will make a weak growth, and many of the plants will turn yellow and die. In isolated localities, where the crop has not been grown, some difficulty may be expected from lack of inoculation during the first season. Inoculation of a new field may be secured either by the soil-transfer method or by the use of pure cultures. The soil-transfer method consists in scattering soil from an old well-inoculated Soya Bean field over the new ground at the rate of 200 to 300 lb. per acre. To ensure even scattering, this should be thoroughly mixed with several times its weight of ordinary soil. The scattering should be done on a cloudy or even a wet day, or late in the evening, and harrowed in immediately, as bright sunshine is very harmful to the germs. When the first crop is a failure in isolated places where neither pure culture nor inoculated soil can be obtained, a small crop must be grown successively two or even three times on the same plot till a good growth is apparent, showing that the soil has become inoculated; this soil can then be used to inoculate large areas.

HARVESTING FOR FORAGE.

The time for harvesting the Soya Bean will necessarily depend somewhat upon the use for which the crop is intended. If required for green forage, it is best to cut the plants just as the pods are forming, as, considering palatability and digestibility as well as chemical composition, most can be gained by cutting at this stage. Generally speaking, if the crop is to be used for soiling purposes, cutting can begin when the plants are in early bloom, and can be kept up till the pods are beginning to ripen.

HARVESTING FOR SEED.

Under ordinary conditions the earlier varieties will mature in seventy-five to ninety days from the time of planting. It is generally desirable in harvesting a crop for seed to cut before the pods are entirely mature. If they become too ripe, they are liable to burst open in driving and carrying to the machine, and thus a large part of the seed may be lost. Some farmers recommend cutting for seed when the pods are only half mature. This is a good practice if the straw is to be used for feeding purposes, as it is then more palatable and contains a larger amount of digestible nutrients than when the pods are thoroughly mature. Seeing that the pods mature unevenly on the same plant, it is best to cut for seed when the pods have turned brown, but before they are fully ripe, so as to avoid loss from the lower pods. Harvesting may also be done when the leaves begin to fall.

THRESHING.

Threshing can be done with a flail or with a threshing machine; the plants should be allowed to become thoroughly dry after cutting before they are stocked or put into a barn or shed; they should not be allowed, however, to become too dry or brittle in the field, as much seed may be lost. Threshing is most satisfactorily done in the field without previous stacking, if climatic conditions will permit.

YIELD OF SEED.

Under ordinary conditions, 25 to 40 bushels of seed per acre (from 1,280 to 2,100 kilograms per hectare) would be an average yield. On comparatively poor soils 20 bushels of seed per acre can generally be obtained.

AVERAGE ANALYSIS OF THE SEED OF THE SIX VARIETIES OF SOYA BEANS.

Water		7·70
Fresh or air-dry substance	Fibre	4·60
	Fat	20·35
	Nitrogen-free extract	26·15
	Protein	35·40
	Ash	5·79
		100·0

YIELD OF FORAGE.

The amount of forage obtained will, of course, vary largely according to the conditions under which the crop is grown. Under very favourable conditions as much as 12 tons of green fodder may be produced per acre; under ordinary conditions on fair soil, 7 to 8 tons ought to be obtained. In U.S.A. and Japan the amount of cured hay obtained is about 2 tons per acre. Owing, however, to the coarseness of the stalks, the hay is not eaten as readily as other legumes, so for this reason the Soya Bean can be more advantageously used for green forage or ensilage.

ANALYSES OF GREEN FODDER AND CURED HAY.

GREEN FODDER (EARLY BLOOM TO EARLY SEED).

Water		76·5
Fresh or air-dry substance	Protein	3·6
	Fat	1·0
	Nitrogen-free extract	10·0
	Fibre	6·5
	Ash	2·3
		100·0

CURED HAY (U.S.A.).

Water		12·1
Fresh or air-dry substance	Protein	14·2
	Fat	4·1
	Nitrogen-free extract	41·2
	Fibre	21·1
	Ash	7·3
		100·0

AS PASTURAGE.

The Soya Bean crop can often be profitably utilised for pasturing, particularly for pigs and especially when maize is given in addition. This is advisable when harvesting is interfered with by lack of labour, bad weather, or other causes, or when the crop is grown especially for soil improvement. By this means not only is the crop profitable in itself but the manure is returned to the soil. The usual practice is to turn the hogs into Soya Beans when the pods are nearly full of grain, but before they have begun to ripen.

AS A SOIL RENEWER.

One of the great advantages in growing leguminous crops is the benefit which the soil derives from the nitrogen and other important elements of plant food that are left in it by the crops. Soils that have been impoverished by the continuous growth of cereals or other nitrogen-using crops may be restored to fertility by the cultivation of legumes, such as clover, vetches, lupins, and the Soya Bean. The value of the Soya Bean as a soil restorer depends upon the amount of available plant food which it adds to the soil, and also upon the effect which the roots have upon the mechanical conditions of the soil. Leguminous plants, through the aid of root tubercle-organisms, are able to add to the

available nitrogen of the soil, and hence are extensively used in restoring those deficient in that element. The Soya Bean should be an invaluable crop in all planting districts. It could be planted in cocoanut plantations, to enrich the soil, give fodder to the working cattle, and be a source of profit in supplying food to the natives; the surplus seed being sold readily in South Africa. It also helps in keeping down the weeds.

SOYA BEAN MEAL AND CAKE.

Soya Bean meal and cake have been found to be a most excellent food for dairy cows. It increases the quantity of the milk and improves the quality of the butter, giving it a firm texture and thus improving its keeping qualities; 2 lb. of meal per day is a fair ration for a dairy cow; the cake or meal should be first softened in water and well mixed with lucerne or any other forage given. As can be seen from the analyses, both the meal and cake are rich in oil, albuminoids, and digestible carbo-hydrates.

—	Cake.	Meal.
Water	12·70	11·33
Oil	11·07	43·05
Albuminoids	26·51	30·77
Digestible carbo-hydrates	26·51	30·77
Woody fibre	5·80	5·45
Mineral waters	5·05	5·35
Sand and silica	0·35	0·25
Total	100·0	100·0

The analyses of the meal and cake compare very favourably with the meal and cake of cotton seed and ground nut, but, according to experiments with cattle, the Soya Bean is slightly more digestible. In West Africa great progress has been made in the cultivation of the Soya Bean, where the percentage of oil in the beans is higher than in those from Manchuria, Japan, and U.S.A. There is no reason at all why East Africa should not do just as well and introduce the Soya Bean as another staple crop. Taking into consideration the rainfall, climatic conditions, and the rich, sandy and open nature of the soils found in the higher land in Gaza and Inhambane, the Soya Bean should prove a profitable crop. For East Africa I should advise the yellow variety to be grown. It is hardy; yields a heavy crop; is easily cultivated; it is the variety most favoured in European markets. The yellow variety, known as "Southern," has proved successful in the Transvaal.

SUMMARY.

1. For extensive farming the Soya Bean is the best annual legume to grow for forage in the cotton belt and maize belt.

2. The Soya Bean, whether used as hay, grain, or ensilage, is very valuable as food for live stock.

3. Soya Bean hay is practically identical in feeding value with lucerne, and yields from 2 or 3 tons of hay per acre.

4. Soya Bean grain is more valuable than cotton seed as a supplementary food in the production of pork, mutton, beef, milk, and butter. A bushel of Soya Beans is nearly twice as valuable for food as a bushel of maize. The grain is best ground with an equal quantity of maize before feeding.

5. Generally, harvesting for seed should.be done when all the leaves have fallen from the plant.

6. Mixed with green maize, the Soya Bean is excellent for ensilage. The two crops can be grown together, but it is best to plant in separate fields and mix when putting into the soil.

7. It is necessary to give the soil thorough preparation in order to be successful with Soya Beans. Only fresh seed or seed which has been tested for germination should be planted. Two-year-old seed is usually not reliable. The seeding should be shallow, not exceeding 2 in. in depth, and preferably in rows 30 or, better, 36 in. apart to permit of sufficient cultivation.

8. For harvesting Soya Beans, a mower, with or without a side-delivery attachment, a self rake reaper, or a self binder, can be used. A binder can be used only with tall varieties. The threshing can be done with a threshing machine, flail, or by machines specially designed for handling Soya Beans and cowpeas.

9. As a crop in a short rotation, Soya Beans are very desirable. They can be grown so as to use an entire season in the case of late varieties, or two crops in one season can be secured from some of the early varieties. They can also be used very advantageously to follow a small-grain crop the same season.

THE GUADA BEAN.

(TRICHOSANTHES CUCUMERINA.)

We have received the following interesting description of a plant of the Gourd Family, locally termed a bean. In a footnote, Mr. F. M. Bailey, Colonial Botanist, gives the botanical name of this vegetable. Mr. B. Harrison, of Cudgera Park, Tweed River, who has had much success with this vegetable, writes:—

"Having grown this vegetable for the past season, and knowing how valuable it would prove to Queensland residents especially during the hot, dry, summer months, when vegetables are scarce and difficult to cultivate, I deem it my duty to forward you the information and trust you will kindly publish it for me. I was induced, through reading the following paragraph in one of our papers giving a description of the Solomon Islands, to procure and import some seed, in which I succeeded after some trouble and expense:—

"The writer ('Banaki') says:—'On the kitchen table is an enormous bean which arrests my attention. It is 7 ft. long, and is named "The Guada." Both the pod and beans are edible, and are eaten as French beans are. This green, succulent-looking, delicious

streak is to be cut up into slices and is intended for our host's family dinner to-night, and it would amply provide sufficient vegetables for one meal for half a dozen hungry people.'

"This vine grows from 15 to 20 ft. long, and will bear throughout the year until checked by frost. The flowers are white and fringed and scented, and have five and six petals. The vine bears within a month or two after planting, and produces long, narrow, cucumber-shaped fruit varying in length from 3 to 6 ft., when over-ripe they turn various colours—orange red, and green, with white stripes. They form a delicious dish when used at the right stage, and, apart from being cooked, they make a good substitute as a pickle for cucumbers. They should prove a most useful and prolific adjunct to the vegetable garden more especially during the hot summer months.

"Mr. R. Gillies, Cudgera, Tweed River, to whom I gave a seed some time ago, thus writes to one of our papers *re* this bean:—'I can testify to their value as a table vegetable. Mr. Harrison gave me one bean in January last; from this single seed I have grown about 25 lb. of beans from the one vine, which is growing and bearing heavily yet. Single beans have measured up to 5 ft. 4 in. in length, and to 2 lb. in weight; and we have frequently served up half a bean for a meal. It is usual to expect coarse flesh and rank flavour in such bulky vegetables, but such is not the case with the Guada (or "carpet-snake bean," as it has been locally named).'

"If taken before the beans have quite set in the pod, sliced, and cooked like French beans, and served with white sauce, it is quite a luxury in the bean line. In appearance the Guada resembles a long cucumber rather than a bean."

[Mr. Bailey thinks the plant referred to by Mr. Harrison is *Trichosanthes anguina,* or Snake Gourd, which has been grown in Queensland and for a long time cultivated in Asiatic countries as a vegetable. It is one of the Cucurbit aceæ or Gourd Family.—Ed. "Q.A.J."]

BANANA FIBRE.

Some time ago a report was made by some British experts in fibres that, in their view, some banana fibres submitted to them were "very weak, poor in colour, and woody, only fit for paper, and worth about £7 to £8 per ton." This decision was probably founded (says "Rubber World") upon an inferior or badly scutched sample. Imperial Institute reports upon valuations of banana fibres from British East Africa and other tropical colonies are in many cases very favourable, the valuations ranging from £10 to £50 a ton and averaging over £30, with manila at £36. It is true many of these fibres were from wild plants or from plants not cultivated for their fruit; in many cases they were from varieties distinct from the West India banana. But in at least one case the fibre was from *Musa sapientum,* and was valued at £36 per ton,

with manila at £36. No doubt Mr. Fawcett's opinion is sound at the moment, but an alteration in the values of fruit or fibre, in conjunction with good scutching, might at any time make West Indian banana fibre production profitable. As for the manurial value, the cellulose of the chopped stem might have a mechanical effect upon the soil, but it would have no plant-feeding value. Were the stem scutched on the spot, the waste of the machines would probably prove as useful a manure as the whole stem.

[Fibre from the *Musa Cavendishii* was brought to this office over a year ago, almost equal in strength and fineness to Mauritius hemp, extracted from the *Furcrea gigantea,* and then valued at £27 per ton.—Ed. "Q.A.J."]

Statistics.

COMMONWEALTH METEOROLOGY.

RAINFALL OF QUEENSLAND.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1911.								1912.				
	May.	June.	July.	Aug.	Sept.	Oct.	Nov	Dec.	Jan	Feb.	Mar.	April.	May.
North.													
Ayr	...	...	...	...	...	...	...	...	...	...	3·53	...	1·01
Bowen	0·12	0 2	Nil	0·15	Nil	1·5	0·19	1·32	1·56	3·15	1·86	...	1·76
Cairns	2·08	1 44	1·48	0·27	0 6	0·88	1·95	0 90	4·81	16·68	5·95	...	5·97
Geraldton (Innisfail)...	3·58	5·10	6·20	0 79	0·30	0·73	1·61	0·75	5·50	18·24	6·01	...	41·84
Gindie State Farm ...	0·29	Nil	Nil	0·49	...	0·81	...	3.50	0·68	2·59	1·88	0·63	...
Herberton	0·58	0·36	0·40	0·5	Nil	0·9	0·62	5·36	5·29	2·82	1·47	...	2·20
Hughenden	0·4	0·2	0·2	Nil	Nil	Nil	1·37	0·69	5·78	1·84	3·52	...	0·74
Kamerunga State Nurs.	1 51	...	...	...	...	...	...	...	...	...	...	...	...
Mackay	0·77	0·22	0·43	0·18	0·3	0·93	0·17	0 41	2·08	8·04	·93	..	3·42
Mossman	1·44	0 33	1·28	0·39	0·09	0 55	0·86	3 31	6·06	18·32	17·60	6·40	2·78
Rockhampton	0·56	Nil	0·24	1·17	Nil	0·40	0·6	0·81	2·50	3·24	·14	...	1·98
Townsville	0·7	0·11	Nil	Nil	Nil	0·39	0·31	2·84	1·64	7·57	6·35	...	0·63
South.													
Biggenden State Farm	...	...	...	...	0·79	...	...	...	...	...	...	...	...
Brisbane	0·90	0 9	1·70	2·22	0·84	4·95	0·84	1·94	1·85	2·13	1·03	...	0·20
Bundaberg	0·56	Nil	0·37	1·15	Nil	2·36	1·30	2·98	3·96	2·47	...	..	1·33
Bungeworgorai (Roma State Farm)	...	...	...	...	...	...	...	...	0·73	...	2·19	Nil.	...
Crohamhurst	1·21	0·13	3·58	2·62	0·51	6·27	1·74	3·02	5·62	8·72	31·73	1·77	...
Dalby	0·91	Nil	0·68	0·43	0·42	3·45	1·99	1·55	1·76	2·58	·53	...	Nil
Esk	1·90	Nil	...	1·51	2·04	4·17	0 47	0 44	1·38	8·26	·22	...	0·11
Gatton Agric. College	0·58	Nil	0·72	0·99	0·96	3 77	0·49	1·90	3·56	3·31	7·86	0·31	...
Gympie	0·32	Nil	0·97	0·48	0·26	2·42	0 50	2·10	2·92	4·47	·15	...	0·52
Ipswich	0·42	Nil	0·59	1·12	0·34	4·71	0·25	...	1·87	3·00	·41	...	Nil
Maryborough	0·16	0·11	0·62	1·47	0·9	2·81	0·90	4 98	2·39	3·93	·11	...	1·09
Roma	1·13	Nil	0·67	1·55	0·87	1·9	1·55	1·19	0·74	0 76	·85	...	Nil
Roma State Farm ...	·02		...	1·39	0·74	1·31	1·29	1·45	...	0·60	...	...	...
Tewantin	0·57	0·22	2·53	1·07	0·4	7·48	1·14	2 13	5·60	4·25	·85	...	8·46
Toowoomba	...	...	...	...	...	...	...	...	...	...	·52	...	0·16
Warren State Farm ...	...	Nil	0·6	1·01	...	0·64	..		0 82	1·75	2·04	0·22	1·28
Warwick	1 04	Nil	1·20	1·50	0·80	1·78	2·26	0·70	1·57	3·45	·56	...	0·9
Warwick, Hermitage State Farm ...	...	...	...	...	...	0·60	...	...	...	...	...	...	...
Westbrook State Farm	0·79	0·1	1·1	0·54	0 82	1·77	2·68	0·23	1·16	2.33	4·48	Nil.	·12
Yandina	0·28	Nil	2·43	Nil	0·30	2·90	1·36	1·87	5·95	4·84	·95	...	1·39

NOTE.—The rainfall data in this table are compiled from telegraphic reports, and must be considered as approximate only.

GEORGE G. BOND, Divisional Officer.

Animal Pathology.

A FEW NOTES ON INDIGESTION IN CATTLE.

By A. H. CORY, M.R.C.V.S.

It must be remembered that the stomach of ruminants is composed of four compartments—viz., the rumen (or paunch), the reticulum (or honeycomb), the omasum (or bible), and the abomasum (or true stomach).

The various forms of indigestion are—

1st. The accumulation of gases in the rumen (paunch).
2nd. Impaction of the rumen (paunch).
3rd. Impaction of the reticulum (honeycomb).
4th. Indigestion of the abomasum (true stomach).

THE ACCUMULATION OF GASES IN THE RUMEN—"HOVEN" OR "TYMPANITES."

CAUSES.—When an animal is not too well, external influences, such as sudden changes of temperature, excessive heat or cold, affects them, and is, therefore, a great predisposing cause. Other causes are feeding on young succulent lucerne or sorghum, and turning animals suddenly on to a fresh spring of grass or any other food which ferments and causes the formation of gases. Choking also causes tympanites, but in this case it is due to the gullet being blocked when the normal gases cannot be eructated by the animal. Gases frequently form in the rumen when wire or other foreign bodies are in the stomach penetrating the wall, and the animal is afraid to ruminate, the ordinary functions of the stomach consequently being altered.

SYMPTOMS.—The animal appears uneasy, refuses to eat, and in a few minutes the left flank begins to get prominent. The right flank may also appear full (but not to the same extent as the left); this is due to the extended rumen pushing the bowel out of its normal position. As the left flank increases in fullness, the animal becomes greatly disturbed, the breathing is very rapid, the nostrils are dilated and the mucous membranes of eyes and nostrils become congested and much darker than normal in colour. In acute cases the animal refuses to move, and finally falls down to die from carbonic-acid poisoning and suffocation. The progress of this affection depends largely on the nature of the food causing the trouble. Cattle and sheep may die in less than one hour, although in most cases the symptoms come on slowly and the animal may be blown for twenty-four hours before recovery or death takes places. It must be noted that the quicker the gases accumulate, the more serious is the case, and the treatment more urgent.

TREATMENT.—To prevent hoven, never suddenly change the food of animals, as from dry food to green succulent lucerne or grass. Let the

change be gradual, as is accomplished by mixing the green and dry food together, or by only allowing the cattle on the fresh green feed for a very short time.

CURATIVE TREATMENT consists of giving the animal a drench containing 2 oz. of turpentine in 1 pint of raw linseed oil, well mixed together and given slowly; or give 4 oz. of hyposulphite of soda and 2 oz. of aromatic spirit of ammonia mixed in 1 pint of cold water. These drenches largely prevent further fermentation, and can be repeated in two hours if the animal is not relieved. Well massage the left flank from above downwards; this assists the over-distended rumen to contract and thus force some of the gas into the other compartments of stomach and also into the œsophagus (gullet). Sometimes a piece of wood about 1 ft. long (part of a broom handle) is placed in the animal's mouth, similar to a bit, and kept in position by means of a piece of cord being attached to each end and passed over the head, like a bridle; this causes the animal, in some cases, to eructate gases. In very sudden cases, it will be necessary before giving any internal medicines to puncture the rumen with a trocar and canula. The spot chosen for puncturing is on the left side, equally distant from the hip bone, the short ribs, and the last long rib. When one has determined the spot, the trocar and canula is quickly inserted, the direction being inward, downward, and slightly forward. The trocar is now withdrawn, when the gases rush out; the canula should be left in position until the gases cease to come from it. If the canula becomes choked with partially digested food, it must be cleared by passing the trocar again through the canula. It is sometimes necessary to leave the canula in position for twenty-four or forty-eight hours, in which case it should be tied there by means of a piece of cord or tape being attached to it and then passed around the animal's body. In all cases, after the acute symptoms have disappeared, it is advisable to give a purgative to remove the fermenting food from the rumen; ¾ lb. of Epsom salts and 1 oz. of ginger, mixed in 1½ pints to 2 pints chilled water, will answer the purpose.

The other forms of indigestion will be continued later.

General Notes.

PREPARING BOTANICAL SPECINENS FOR TRANSIT.

Mr. F. M. Bailey, Colonial Botanist, gives the following directions for collecting botanical specimens which have to be sent by post for naming. It often happens that correspondents forward to him a flower, or a few leaves, or some portion of a plant, which it is next to impossible for him to determine owing to the neglect of the sender to observe certain conditions which are here set forth:—

A botanical specimen is such a portion of a plant as may enable a botanist to determine its name, &c. Thus, of a tree or shrub, a shoot, say 6 in. or 9 in. long, bearing leaves, flowers, and fruit, if possible, will be sufficient. Of herbs when small, an entire plant should be sent, collected when in flower. Of herbs of a large size, a portion of the lower (radical leaves), and also a portion of the top, in flower or seed. All specimens should represent the typical form—not an abnormal or irregular growth, except to show such growth. After gathering, place the specimen between sheets of paper (old newspaper), and put the whole under a slight pressure; these papers should be changed for dry sheets every day for three or four days, when, if the specimens are not of a succulent nature, they will be in a fit state to forward by post, the cost of which will be 1d. for every 2 oz. from any part of the State; or by parcel post, the cost of which is 6d. for first lb. and 3d. for each additional lb. up to 11 lb. Parcels should be marked "Botanical Specimens Only," and addressed to the "Colonial Botanist, Brisbane." Number specimens, and retain duplicates.

RICE-GROWING EXPERIMENTS.

In our June issue it was stated that the experiments in rice-growing were carried out at the Roma State Farm, whereas it was at the Warren Farm that the rice was grown.

Answers to Correspondents.

TABLE OF UTERO-GESTATION.

Animal.	Average Period.	Early Period for Young to Live.	Late Period.
Mares	335-345 days (11-11$\frac{1}{3}$ months)	307 days (10 months)	365 days (12 months)
Cows	275-287 days (39-41 weeks)...	242 days (34$\frac{1}{2}$ weeks)	312 days (44$\frac{1}{2}$ weeks)
Sheep and goats	149-151 days (21-21$\frac{1}{2}$ weeks)	140 days (20 weeks) ...	160 days (23 weeks)
Sows	112-119 days (16-17 weeks)...	105 days (15 weeks) ...	126 days (18 weeks)
Bitches	63 days (9 weeks)	55 days (8 weeks) ..	70 days (10 weeks)
Cats	55 days (8 weeks)	50 days	64 days
Rabbits	28-30 days (4 weeks) ...		

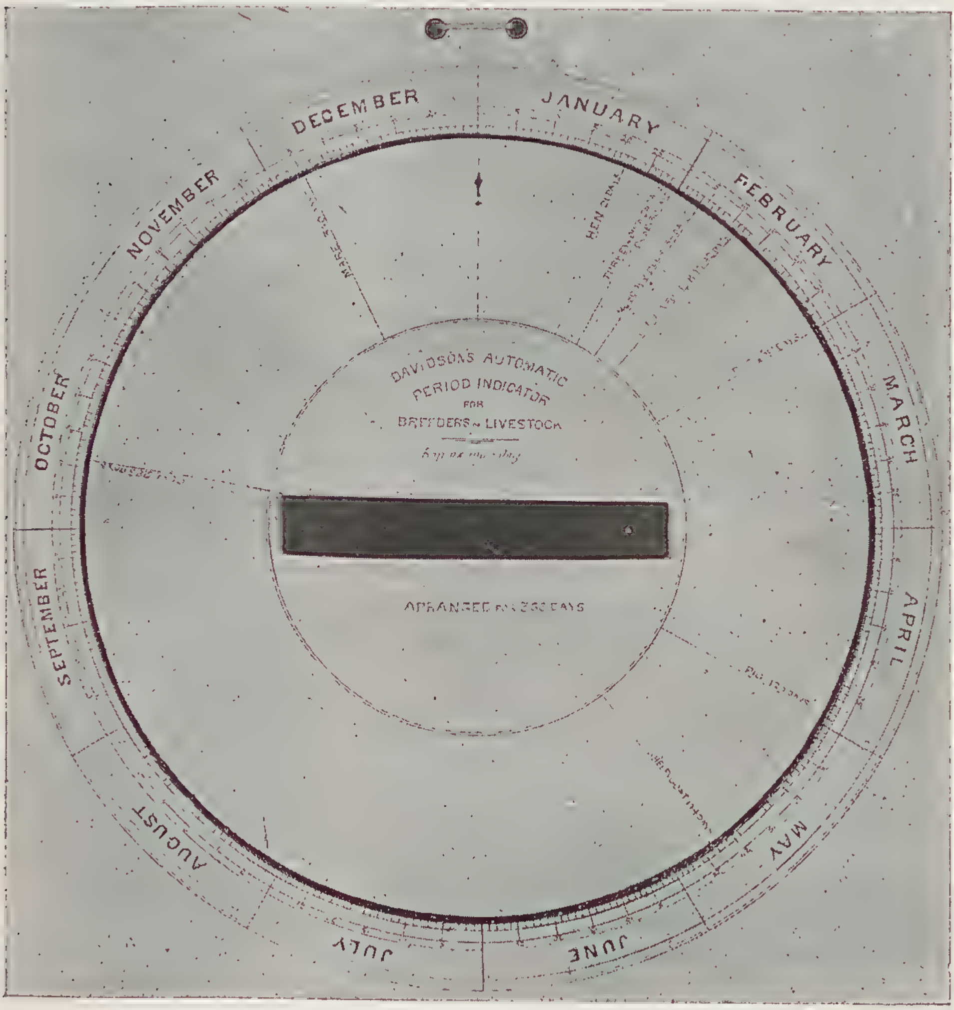


PLATE 13.—DAVIDSON'S AUTOMATIC PERIOD INDICATOR.

INARCHING.

"VIGNERON," Eumundi—

This may be performed with either the growing shoot or with that in a rest state. A plant established in a pot, of the kind to be introduced, must be procured. With regard to inarching in a rest state, it is proper that the sap should be in motion at the period of operating, and that the stock, if possible, should, as in grafting, be slightly in advance of the scion. Vines which are breaking are in an eligible state, and the kind to be inarched may be just emerging from a rest state.

The point of junction being determined, the pot must be so fixed that no slipping can occur, and that the shoot may be readily bent to meet the parent plant. Nothing is necessary but to pare a thin slice of bark with a little of the wood from the facings of the scion and stock which are to be fitted, and then to bind them carefully together close, but not too tight, just as in ordinary grafting. A little moss may be fastened round the point of junction, and this should be frequently moistened. Inarching of the growing shoot, is, however, the best practice, but it is an operation which requires nice handling. The shoot of the stock is best at about the middle of its annual growth, when it has begun to acquire some solidity and toughness. The scion may be somewhat younger, and, everything being adjusted, a section must be made in each as before, cutting through the bark and a little into the alburnous matter—*i.e.,* the white and softer part of wood next to the bark, familiarly known as the sap-wood—and fitting them nicely together. It may be observed that the ligature must not be so tight as in the old wood. The whole may be covered with moss, and in six weeks the junction will be complete. In the meantime, a progressive stopping of the spray on the stock must take place, in order, by degrees, to transfer a portion of the luxuriance of the stock to the scion.

When the pruning season arrives, the stock may be cut back in part or wholly. Thus a vineyard possessing inferior kinds may be renovated in a very short period.

DESTRUCTION OF NUT GRASS.

J.A., Sunnybank, Gatton—

There has been, as yet, no certain remedy found for the nut-grass pest, except constant cultivation—see the issue of this journal for March, 1911. It is there stated that a farmer on the Clarence River, New South Wales, got rid of it in two years by ploughing the land in winter and keeping the scarifier going with the knives 3 to 4 in. below the surface. Another farmer got rid of it in five years by constantly sowing the land with imphee. Queensland farmers have overcome the grass by planting buffalo grass. Oats will thrive on nut-grass land, so will lucerne. Enclosing the land and running pigs on it has proved successful in the Mary River district (see Vol. V., August, 1899). A flock of turkeys penned on nut grass will eventually destroy it.

CUSTARD APPLES.

R. M'c., Nundah—

Your custard plant is undoubtedly a seedling and should have been grafted years ago. It may still be done by a practical man. Otherwise root it out and plant a good worked tree in its place.

TO CUT THE NECK OR BOTTOM OFF A GLASS BOTTLE.

" FARMER," Nambour—

Get a piece of wire (No. 4 gauge) about 2 ft. long, and turn one end of it to make a circle large enough to pass over the broad part of the neck of the bottle. Put the circle end in the fire till it is red hot; then place it over the bottle neck for a few seconds; take it off and plunge the bottle into cold water. The neck will break off clean just where the ring was placed.

In the old farming days in Queensland, when a good deal of night-work had to be done in the way of loading produce on to farm boats to save a tide, clear glass bottles were used as lamps (snakes being pretty numerous on the tracks). To turn a bottle into a lamp all that was necessary was to fill the bottle up to about 2 in. from the bottom with cold water, set it on the hot ashes as deep as the 2-in. mark, and in a minute or two a crack went clean round the high-water mark, the bottom of the bottle falling off. Then a candle was inserted into the neck, and a useful lamp was provided at no cost.

GROWING CUCUMBERS.

" MARKET GARDENER," Bowen—

Cucumbers require a rich warm soil, and should only be planted when the soil has been well heated. Make the hills 4 ft. apart each way.

Plant plenty of seeds in each hill, and, if more than four come up, the extra ones may be taken up and planted out after the second leaves appear, and transplanted elsewhere. Plant quite deep in the ground, water well, and cover the young plants with paper for the first day or two to keep them from wilting.

The best way to irrigate the plants as soon as they show signs of running is to dig a hole, large enough to hold a quart can, as near the roots as possible. Make holes in the bottom of the can and place them in the holes near the roots of the plants. Put the cans in the ground about 2 in. deep, and fill them with water every other day.

See pamphlet on " Market Gardening," issued by this Department.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR JUNE, 1912.

Article.		JUNE. Prices.
Bacon, Pineapple	lb.	6½d. to 8d.
Bran	ton	£7 5s.
Butter	lb.	9d. to 10d.
Chaff, Mixed	ton	£5 5s. to £7 5s.
Chaff, Oaten (Victorian)	"	£7 10s. to £8
Chaff, Lucerne	"	£8 10s. to £8 15s.
Chaff, Wheaten	"	£6 to £7
Cheese	lb.	6d. to 9d.
Flour	ton	£10
Hay, Oaten (Victorian)	"	£8 to £8 10s.
Hay, Lucerne	"	£9
Honey	lb.	2d. to 2¾d.
Maize	bush.	5s. 4d. to 5s. 6d.
Oats	"	4s. 2d. to 4s. 6d.
Pollard	ton	£8
Potatoes	"	£8 to £10 10s.
Potatoes, Sweet	cwt.	3s. 6d. to 4s. 6d.
Pumpkins	ton	£2 10s. to £2 15s.
Wheat, Milling	bush.	4s. 9d. to 5s. 3d.
Onions	ton	£14
Hams	lb.	1s. 1d.
Eggs	doz.	1s. 8d. to 1s. 11d.
Fowls	pair	2s. 9d. to 4s. 3d.
Geese	"	5s. 6d. to 6s.
Ducks, English	"	3s. 6d. to 4s.
Ducks, Muscovy	"	4s. to 5s.
Turkeys (Hens)	"	7s. to 8s.
Turkeys (Gobblers)	"	15s. to 17s.

SOUTHERN FRUIT MARKETS.

Apples (Choice Eating), per case	7s. to 9s.
Apples (Cooking), per case	6s. to 7s.
Bananas (Fiji), G.M., per bunch	2s. 6d. to 10s.
Bananas (Fiji), G.M., per case	5s. to 17s. 6d.
Bananas (Queensland), per bunch	1s. to 5s.
Bananas (Queensland) per case	10s. to 10s. 6d.
Cocoanuts, per dozen	2s. 6d. to 4s.
Lemons (local), per gin case	6s. to 7s.
Mandarins (Emperors), per case	5s. to 7s.
Oranges (Maryborough), per bushel case	4s. to 7s.
Papaw Apples, per case	2s. to 3s.
Passion Fruit, per case	4s. to 5s.
Peaches, per case	5s. to 8s.
Peanuts, per lb.	5½d.
Pears, per bushel case	7s. to 12s.
Persimmons, per half-case	2s. to 6s.
Pineapples (Queensland), common, per case	6s. 6d. to 8s. 6d.
Pineapples (Queensland), Ripley's, per case	6s. 6d. to 8s. 6d.
Pineapples (Queensland), Queen's, per case	7s. to 10s.
Quinces, per gin case	3s. 6d. to 5s.
Tomatoes, per half-case	4s. to 5s.
Cucumbers, per dozen	1s. to 1s. 3d.

PRICES OF FRUIT—TURBOT-STREET MARKETS.

Article.	JUNE. Prices.
Apples (Eating), per case	3s to 9s.
Apples (Cooking), per case	8s. to 10s.
Apricots, per case	
Bananas (Cavendish), per dozen	3d. to 4d.
Bananas (Sugar), per dozen	2½d. to 3½d.
Cape Gooseberries, per case	5s. to 8s.
Cherries, per quarter-case	...
Citrons, per cwt.	12s.
Custard Apples, per quarter-case...	5s. to 6s. 6d.
Grapes, per lb.	...
Lemons (Italian), per case	...
Lemons, per case	5s. to 6s.
Mandarins, per case	4s. to 6s.
Mangoes, per case	...
Nectarines, per quarter-case	...
Oranges (Navel), per case	7s. 6d. to 9s.
Oranges (Other), per case	3s. to 4s. 6d.
Papaw Apples, per quarter-case	1s to 2s.
Passion Fruit, per quarter-case	5s. to 7s.
Peaches, per quarter-case	
Peanuts, per lb.	2½d.
Pears, per case	...
Persimmons, per half-case...	...
Plums, per quarter-case	
Pineapples (Ripley), per dozen	1s. 6d. to 4s. 6d.
Pineapples (Rough), per dozen	1s. 6d. to 4s. 6d.
Pineapples (Smooth), per dozen	3s. 6d. to 5s. 6d.
Rockmelons, per dozen	...
Rosellas, per quarter-case	...
Strawberries, per tray	3s. 6d. to 4s. 6d.
Tomatoes, per quarter-case	2s. 6d. to 5s.
Watermelons, per dozen	...

TOP PRICES, ENOGGERA YARDS, MAY, 1912.

Animal.	MAY. Prices.
Bullocks	£7 15s. to £8 17s. 6d.
Bullocks (single)	...
Cows	£5 15s. to £6 17s. 6d.
Merino Wethers	18s. 3d.
Crossbred Wethers...	19s. 6d.
Merino Ewes	14s. 3d.
Crossbred Ewes	15s. 3d.
Lambs	16s.
Pigs (Baconers)	34s.
Pigs (Porkers)	25s.

Farm and Garden Notes for August.

This and the following two months are about the busiest periods of the year so far as work in the field is concerned; and the more activity now displayed in getting in the summer crops, the richer will be the reward at harvest time. Potatoes should be planted, taking care to select only good sound seed that has sprouted. This will ensure an even crop. Yams, arrowroot, ginger, sisal hemp, cotton, and sugar-cane may now be planted. Sow maize for an early crop. If the seed of prolific varieties is regularly saved, in the end it will not be surprising to find from four to six cobs on each stalk. This has been the experience in America, where the selecting of seeds has been reduced to a fine art.

In choosing maize for seed, select the large, well-filled, flat grains. It has been shown that, by constantly selecting seed from prolific plants, as many as five and six cobs of maize can be produced on each stalk all over a field. A change of seed from another district is also beneficial. Sow pumpkins, either amongst the maize or separately, if you have the ground to spare. Swede turnips, clover, and lucerne may be sown, but they will have to contend with weeds which will begin to vigorously assert themselves as the weather gets warmer; therefore keep the hoe and cultivator constantly going in fine weather. Tobacco may be sown during this month. If vines are available, sweet potatoes may be planted towards the end of the month. In this case also it is advisable to avoid too frequent planting of cuttings from the old vines, and to obtain cuttings from other districts. If grasses have not yet been sown, there is still time to do so, if the work be taken in hand at once. Sugar-cane crushing will now be in full swing, and all frosted cane in the Southern district should be put through the rollers first. Plough out old canes, and get the land in order for replanting. Worn out sugar lands in the Central and Northern districts if not intended to be manured and replanted will bear excellent crops of sisal hemp. Rice and coffee should already have been harvested in the North. The picking of Liberian coffee, however, only begins this month. Collect divi-divi pods. Orange-trees will be in blossom, and coffee-trees in bloom for the second time. As this is generally a dry month in the North, little can be done in the way of planting.

Kitchen Garden.—Nearly all spring and summer crops can now be planted. Here is a list of seeds and roots to be sown which will keep the market gardeners busy for some time: Carrots, parsnip, turnip, beet, lettuce, endive, salsify, radish, rhubarb, asparagus, Jerusalem artichoke, French beans, runner beans of all kinds, peas, parsley, tomato, egg-plant, sea-kale, cucumber, melon, pumpkin, globe artichokes. Set out any cabbage plants and kohl-rabi that are ready. Towards the end of the month plant out tomatoes, melons, cucumbers, &c., which have been raised under cover. Support peas by sticks or wire-netting. Pinch off the tops of broad beans as they come into flower to make the beans set. Plough or dig up old cauliflower and cabbage beds, and let them

lie in the rough for a month before replanting, so that the soil may get the benefit of the sun and air. Top dressing, where vegetables have been planted out, with fine stable manure has a most beneficial effect on their growth, as it furnishes a mulch as well as supplies of plant food.

Flower Garden.—All the roses should have been pruned some time ago, but do not forget to look over them occasionally, and encourage them in the way they should go by rubbing off any shoots which tend to grow towards the centre. Where there is a fine young shoot growing in the right direction, cut off the old parent branch which it will replace. If this work is done gradually it will save a great deal of hacking and sawing when next pruning season arrives. Trim and repair the lawns. Plant out antirrhinums (snapdragon), pansies, hollyhocks, verbenas, petunias, &c. Sow zinnias, amaranthus, balsam, chrysanthemum, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins; and plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. In the case of dahlias, however, it will be better to place them in some warm moist spot, where they will start gently and be ready to plant out in a month or two. It must be remembered that this is the driest of our months. During thirty-eight years the average number of rainy days in August was seven, and the mean average rainfall 2·63 in., and for September 2·07 in., increasing gradually to a rainfall of 7·69 in. in February.

Orchard Notes for August.

THE SOUTHERN COAST DISTRICTS.

The remarks that have appeared in these notes during the last few months respecting the handling and marketing of Citrus Fruits apply equally to the present month. The bulk of the fruit, with the exception of the latest ripening varieties in the latest districts, is now fully ripe, and should be marketed as soon as possible, so that the orchards can be got into thorough order for the Spring growth. All heavy pruning should be completed previous to the rise in the sap; and where winter spraying is required, and has not yet been carried out, no time should be lost in giving the trunks, main branches, and inside of the trees generally a thorough dressing with the lime and sulphur wash.

Where there are inferior sorts of seedling citrus trees growing, it is advisable to head same hard back, leaving only the main trunk and four or five well balanced main branches cut off at about 2 ft. from the trunk. When cut back give a good dressing with the lime and sulphur wash. Trees so treated may either be grafted with good varieties towards the end of the month or early in September; or, if wished, they may be allowed to throw out a number of shoots, which should be thinned out to form a well balanced head, and when large enough should be budded with the desired variety.

Grafting of young stock in nursery, not only citrus but most kinds of deciduous fruits, can be done this month. It comes in useful in the case of stocks that have missed in budding, but for good clean grown stocks I prefer budding.

In the case of working our Seville orange stocks to sweet oranges, grafting is, however, preferable to budding, as the latter method of propagation is frequently a failure. The Seville stock should be cut off at or a little below the surface of the ground. If of small size, a single tongue graft will be sufficient, but if of large size, then the best method is the side graft—two or more grafts being placed in each stock, so as to be certain of one taking. In either case the grafts are tied firmly in place, and the soil should be brought round the graft as high as the top bud. If this is done, there will be few missed, and undesirable Seville stocks can be converted into sweet oranges.

In selecting wood for grafting, take that of last season's growth that has good full buds and that is well-matured—avoid extra strong, or any poor growths.

Seville oranges make good stocks for lemons. In case it is desirable to work them on to lemons, it is not necessary to graft below ground, as in the case of the sweet orange, but the stock can be treated in the same manner as that recommended in the case of inferior oranges—viz., to head hard back, and bud on the young shoots.

Where orchards have not already been so treated, they should now be ploughed so as to break up the crust that has been formed on the surface during the gathering of the crop, and to bury all weeds and trash. When ploughed, do not let the soil remain in a rough, lumpy condition, but get it into a fine tilth, so that it is in a good condition to retain moisture for the trees' use during Spring. This is a very important matter, as Spring is our most trying time, and the failure to conserve moisture then means a failure in the fruit crop, to a greater or lesser extent.

Where necessary, quickly acting manures can be applied now. In the case of orchards, they should be distributed broadcast over the land, and be harrowed or cultivated in; but, in the case of pines, they should be placed on each side of the row, and be worked well into the soil.

The marketing of pines, especially smooths, will occupy growers' attention, and where it is proposed to extend the plantations the ground should be got ready, so as to have it in the best possible condition for planting, as I am satisfied that the thorough preparation of the land prior to planting pines is money very well spent.

The pruning of all grape vines should be completed, and new plantings can be made towards the end of the month. Obtain well-matured, healthy cuttings, and plant them in well and deeply worked land, leaving the top bud level with the surface of the ground, instead of leaving 6 or 7 in. of the cutting out of the ground to dry out, as is often done. You only want one strong shoot from your cutting, and from this one shoot you can make any shaped vine you want. Just as

the buds of the vines begin to swell, but before they burst, all varieties that are subject to black spot should be dressed with the sulphuric acid solution—viz., three-quarters of a pint of commercial sulphuric acid to one gallon of water; or, if preferred, this mixture can be used instead—viz., dissolve 5 lb. of sulphate of iron (pure copperas) in one gallon of water, and when dissolved add to it half a pint of sulphuric acid.

THE TROPICAL COAST DISTRICTS.

Bananas should be increasing in quality and quantity during the month, and though, as a rule, the fruit fly is not very bad at this time of the year, still it is advisable to take every care to keep it in check. No over-ripe fruit should be allowed to lie about in the gardens, and every care should be taken to keep the pest in check when there are only a few to deal with, as, if this is done, it will reduce the numbers of the pest materially later on in the season. The Spring crop of oranges and mandarins will be now ready for marketing in the Cardwell, Tully, Cairns, and Port Douglas districts. For shipping South see that the fruit is thoroughly sweated, as unless the moisture is got rid of out of the skins the fruit will not carry. Should the skins be very full of moisture, then it will be advisable to lay the fruit on boards or slabs in the sun to dry; or, if this is not possible, then the skin of the fruit should be artificially dried by placing same in a hot chamber, as the moisture that is in the skin of our Northern-grown citrus fruits must be got rid of before they will carry properly.

Papaws and granadillas should be shipped South, and the markets tested. If carefully packed in cases holding only one layer of fruit, and sent by cold storage, these fruits should reach their destination in good order. Cucumber and tomato shipments will be in full swing from Bowen. Take care to send nothing but the best fruit, and don't pack the tomatoes in too big cases, as tomatoes always sell on their appearance and quality.

THE SOUTHERN AND CENTRAL TABLELANDS.

All fruit-tree pruning should be finished during the month, and all trees should receive their winter spraying of the lime and sulphur wash.

All new planting should be completed, orchards should be ploughed and worked down fine, and everything got ready for Spring.

In the warmer parts, grape-pruning should be completed, and the vines should receive the Winter dressing for black spot. In the Stanthorpe district grape-pruning should be delayed as late as possible, so as to keep the vines back, as it is not early but late grapes that are wanted, and the later you can keep your vines back the better chance they have of escaping Spring frosts.

Towards the end of the month inferior varieties of apples, pears, plums, &c., should be worked out with more desirable kinds; side, tongue, or cleft grafting being used. In the case of peaches, almonds, or nectarines, I prefer to head back and work out by budding on the young growth.

QUEENSLAND AGRICULTURAL JOURNAL

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Agriculture.

FARMING WITH DYNAMITE.

Since the publication of our articles on the value of dynamite as an aid to clearing land, and to subsequent agricultural operations, in the last two issues of this Journal, judging by the numerous letters we have received from farmers and fruit-growers seeking further information on the subject, much interest—we might almost say enthusiasm—has been aroused in many parts of the State in connection with the use of dynamite on the land. There is an impression that this method of clearing and breaking up land is of very recent origin, but this is far from being the case. It is a thorough and now well-established scientific principle for preparing the ground for crops. Some of the farmers in the Western United States of America have regularly blasted their ground for the past twenty and thirty years, and their bumper crops have always been envied by their neighbours, situated upon perhaps finer soil, but who are content with the general ploughing methods. Coming nearer home, we find that dynamite has been regularly used by Mr. Howard, at Indooroopilly, for the past eight years, with most satisfactory results.

"The World's Work" for April, 1912, has a very excellent explanatory article on the subject, from which we extract the following items:—

PRINCIPLES OF THE IDEA.

Farming by dynamite has, in fact, grasped the United States, and is spreading through Canada and Mexico like a prairie fire. The farmers

who have tried it swear by it, and are upheld by the leading authorities in agricultural science. It seems a strange way of making the ground bring forth its produce in plenty, but there is no getting away from the fact that it acts.

Doubtless the man who tried the trick first and met with success was quite in the dark as to why it succeeded. It is a moot point whether he served his purpose further than that it worked admirably. Yet, as a matter of fact, he was achieving the very best result he ever could aspire to accomplish. The soil had become hard through various causes, and the water was unable to percolate to dissolve the food upon which the plant flourishes. The plough breaks up the top surface so that the water can mingle and dissolve the plant nutriment to the depth of a few inches. The subsoil, however, is left just as intact, and the roots of the crops have to feed upon what they can draw from the land broken up by the plough. The ingenious "Hayseed" who, in desperation, had recourse to dynamite and buried it in holes drilled in the hard soil, broke the ground up into small pieces for a depth of several feet, letting in the water, which dissolved the essential nutriment, while the roots were able to descend to a greater depth, and were able to secure their fill of food. Then, again, being given facilities to extend directly downwards, the roots do not grow laterally and invade each other's feeding area, as is the case when there is only a top shallow layer of porous soil.

When news of this method of breaking up the ground first leaked out, it was received with considerable derision among the sceptical, but the agricultural specialist realised that there was method in the backwoodman's apparent madness. The experimental farms tested the matter for themselves and found that there was a decided difference in a plot of ground, one-half of which had been blasted, and the other had been ploughed in the usual manner, when sown with seed from one harvest. The blasted ground was found to produce crops running from 50 per cent. upwards in superiority and yield.

This clinched the argument in favour of dynamite farming, but then another difficulty arose. Dynamite is a peculiar tool with which to pursue agricultural operations. It must be handled in a certain manner, must not be subjected to violent extremes of temperature, freezes quickly—in fact, was just the implement which the average farmer should not use unless the death rate was to be sent up.

CHEMIST TO THE RESCUE.

Contemporaneously with the experiments of the Government agricultural experimenters, the chemists in the Wilmington laboratories of the E. I. Dupont de Nemours Powder Company were hard at work. The dynamite which the ordinary blaster used for removing rocks to admit of the building of railways, harbours, mining, and other works, was all very well, but it demanded the services of an accomplished hand. Accordingly, the chemists sought to prepare a special dynamite, suited to farm use, and which would be far safer to handle. Their efforts, at last, were crowned by success, and the "Red Cross" dynamite to-day, through the length and breadth of the continent, is regarded as the

agriculturist's most faithful and reliable friend. It was found possible to evolve an explosive of this character which does not freeze so readily as ordinary dynamite, and, altogether, is perfectly safe to handle so long as common sense is displayed.

The sticks are carefully prepared and the instructions issued are of such a character that the best results are obtained with the minimum expenditure of explosives. The soil must not be pulverised into powder, but is gently shattered in all directions, so that, for a depth of about 8 feet, it is loosened and disintegrated. The method is exceedingly simple. A long auger drills a hole vertically into the ground. The stick or cartridge, carrying its length of fuse, which projects a few feet above the ground, is then slipped in. (We note that no mention is made of the use of a detonator.—Ed. "Q.A.J.") The hole is now filled up with soil, which is rammed down tightly by the aid of a wooden stick. Then the fuse is lighted, and one and all retire until the blast has done its work. The system has come into extensive vogue for ploughing fields deeply. The men advance one behind the other in rows so many feet apart, and, at regular intervals, the charges are tamped home. When the cartridges have been laid, the men proceed across the field in a line, one to each row, lighting the fuses as they move forward. Before they have proceeded half-way across the tract, the charges first fired go off, sending a plume of earth into the air. From the side of the field the sight is somewhat uncanny, as the land seems to be undergoing some violent subterranean disturbance, bursting into big waves of dirt and smoke as the charges ignite in rows one after the other. When the field has been treated in this manner, the plough is run over in the usual way and the crops are sown.

STUMP CLEARING.

Not only has dynamite farming enabled large tracts of land formerly considered to be unfit for agriculture, owing to the hard nature of the soil, to be brought under cultivation with complete success, but it has facilitated the task of the homesteader in his clearing operations. No longer are the stumps of the biggest trees as difficult to extract as well-rooted molars; no longer is there any need to hoist a chain and hook around the obstacle, and then to pull it out by sheer force by means of a team of horses; there is no need to burn it out. The homesteader, with his auger, drills a slanting hole through the root of the tree (under the root? See diagram in the June issue of the Journal.—Ed. "Q.A.J.") from the surface, inserts the stick of dynamite, plugs up the hole with his tamping stick, and then fires the fuse. The stump, in a few seconds, is sent sky high, torn to shreds, to fall a dishevelled mass on the ground, the splintered wood afterwards being collected at leisure to be piled into heaps and burned. (See "Q.A.J." for February, 1902, and May, 1908.—Ed. "Q.A.J.") In clearing the land in this manner, the homesteader performs two useful operations. He clears the roots out of his way with the minimum of trouble and expense and breaks up the subsoil thoroughly, letting in water and air, so that he reaps a good harvest from his first sowing.

Similarly, the farmer who concludes that his land will be benefited if he can give it more water, does not go to enormous expense in digging irrigation ditches by means of steam shovels, picks, and wheelbarrows. Gangs of men, three or four in a wide row, advance over the line the ditch is intended to take. The front company drills the holes, that behind slips in the cartridges and tamps them home. In this case, the fuses are joined together, and a hundred or more cartridges are fired simultaneously. When the charging is completed, the men retire to a safe distance, the blaster observes that the coast is clear, gives his electric machine handle a strong drive home, and the next instant a serrated wall of earth and smoke towers into the air like a row of geysers.* When the turmoil has subsided, lo! there is a ditch torn out bodily, following a well-defined line, and often, by the time the men reach the banks, the channel is nearly filled with water.

So far as clearing is concerned, when the timber is useless, the farmer does not often trouble to axe down the trunks. He blows the whole tree bodily out of the ground to topple over on one side,* when it may be lopped up, or pulled along with others into a heap and fired.

EFFICIENCY AND ECONOMY.

The method is not expensive, and that is its great recommendation. One man can do the whole job if required. Of course, the cost varies according to the character of the stump to be removed; a small jack-pine stump, 20 inches in diameter, is not so refractory as a big Californian redwood about 8 feet across. In the first case, the total expense will be about 8d., while in the latter 8s. will probably be nearer the figure, this including everything—wages, dynamite, and cost of disposing of the *débris.* In each case, however, the stump will be pulled out completely in one blast. It is merely a question of more bore holes and charges for the huge redwood, but it will be sent sky-high in smithereens as completely as the insignificant jack-pine stump.

It must not be thought that this method of farming is a mere passing fad. It is a thorough, well-established, scientific principle for preparing the ground for crops, and has been in use, as stated, for the past twenty and thirty years by farmers in the West (U.S.A.).

It has also proved a means of renovating exhausted or worn-out ground whereon the crops have been raised until the soil has been drained of its nourishment near the surface.

Fertilisers may be used, but their benefits are of short duration. Yet, 3 feet below the surface the soil is every whit as good as was that formerly on the top, only the roots cannot get into it to absorb the elements which they like. A few pounds of dynamite, loosening this compact, hard subsoil, will do far more good, at an expense of £2 or £3 per acre, than tons of manure, as results have proved.

* For blasting stumps simultaneously, see "Q.A. Journal" for May, 1908.

PLANTING FRUIT TREES WITH DYNAMITE.

Possibly, what at first sight appears to be the strangest application of dynamite is for the purpose of planting trees. Yet its success in this connection is peculiarly remarkable. When a hole is made with a spade, the surrounding soil is left in its hard condition. The result is that the roots find it difficult to start. They are cramped in the tight quarters of the hole, and cannot pierce the hard wall of earth. Under these circumstances, growth is appreciably retarded for a considerable time. With dynamite, a large clean hole is blasted out, and in addition the soil on all sides is loosened for 5 or 6 feet. When the tree is planted, the young and tender roots force their way without effort through the crevices, sucking up nourishment, and commence to grow from the moment they are set, without any retardation whatever.

One lady fruit-grower in Oregon has tried both methods of planting and is enthusiastic in her appreciation of the dynamite system. She has every cause for this satisfaction, too. The trees planted in the dynamited holes grow twice as quickly as those set in the usual spade holes, and the difference between the two systems with trees of the same age set side by side is very marked. In this case, the orchard is set out with stakes, each indicating the position of a tree. One man first removes a spadeful of earth from about the stake, this being used subsequently for filling up the hole when the tree is planted. He is followed by a second man, armed with a crowbar and dynamite. He withdraws the stake, inserts the crowbar, and extends the depth of the hole until it is about 18 inches below the surface, boring his way through all hard material such as clay. The stick of "Red Cross" is dropped in, tamped home, and several shovelfuls of earth are thrown on top and trodden down around the projecting fuse. A clean hole is produced by the explosion, the greater force of which has been expended downwards through the subsoil, and shattering it. The hole is permitted to stand over night, and the next day the tree is planted. This lady was so impressed with the success of the method and the stronger and more luxuriant growth of the trees planted in this manner, that over thirty acres of orchard were planted with dynamite. In fact, she has become so wedded to the system that she broke sticks of dynamite in halves, and used a moiety for each tree of a rose bed, as well as planting the perennials in her flower borders in the same way. In every instance the end has more than justified the means, although, as she relates, her soil is a rich loam extending to a depth of 6 feet.

A NEW PROFESSION.

The agricultural colleges and experimental stations are firmly convinced of the superiority of dynamite farming and are advocating its adoption strenuously. The experimental grounds are treated in this manner, besides other stretches cultivated on the usual lines, and sown with seed from the same stock. The superior results accruing from the former treatment are quite readily apparent even to the most unpractised eye. Dynamite farming has also given birth to a new profession. Many farmers regard this explosive with suspicion. They are afraid

that their ignorance will prompt the stick to turn on them with disastrous results. So a keen demand has arisen for expert dynamite farmers—men skilled in the handling of the agent, and ready to do anything, from blasting out stumps, subsoil ploughing by this means, cutting irrigation ditches, blasting holes for fruit trees, posts, and what not. The men are trained thoroughly in the requirements of the art, and have found that dynamite farming, from their point of view, is a highly remunerative, albeit unique calling.

Still, the ordinary farmer, provided he follows the directions set out extensively and clearly, need apprehend no danger from the employment of this implement. Dynamite is by no means such a dangerous agent as popular conception imagines. It can be handled as easily as petrol or matches, and, like these two articles, only turns on the user when submitted to indignities. A little practice and the observance of results achieved soon enable one to become expert in this application, so that the necessity for a professional dynamite farmer may be dispensed with.

In the Southern States where cotton is the staple product, dynamite farming has worked wonders. By ploughing deeply into the soil by the aid of the explosive, dry weather no longer inflicts widespread damage. The streams may run dry and the lakes become empty, but the cotton roots, having penetrated deeply into the soil, are able to obtain a sufficiency of moisture under the most trying climatic conditions. Indeed, the use of dynamite is proving the salvation of the cotton country, and every year the number of farms which are being ploughed in this way is increasing by thousands.

It must not be thought that dynamiting obviates the necessity of top ploughing. Far from it. The plough must be used just as much as ever. The only thing is, that the dynamite expends its disintegrating force in the subsoil, which is never touched by the plough, so that one is not merely planting the crops in the same soil year after year, and only enabled to maintain the yield by recourse to expensive fertilisation. Even in orchards stocked with old trees the method can be practised to distinct advantage. If small charges are fired under them, or between the rows, the ground is broken up, to form a spongy reservoir for moisture, while the explosive spells instant death to all harmful grubs. Then, again, swampy ground can be improved by the intelligent expenditure of a few pounds of the explosive. In many cases this result arises because the clay subsoil forms a water seal, and the surface moisture cannot drain away. By breaking up the clay strata the water is afforded an opportunity to escape by percolating through the clay, and dissolving the elements for plant life contained therein. One farmer in Kansas was handicapped for years by a swamp extending over forty acres on his farm. At last he decided to test the efficiency of blasting a row of holes across the lowest part of the swamp, where the collected water was about 3 feet deep. The result was astonishing. The water sank into the ground, and ever since, that forty acres, which was a nightmare to the owner, has produced four crops of alfalfa (lucerne) every year.

THE USE OF EXPLOSIVES IN CLEARING LAND.

Professor H. L. Russell, Director of the Agricultural Experiment Station, University of Wisconsin, in an explanatory note to Bulletin 216, November, 1911, issued by the University, and written by J. F. Kadonsky, says:—"The magnitude of this work of stump removal may be recognised when it is considered that, as yet, but from one-half to 5 per cent. of the area of many of our northern counties is now under cultivation. The problem is pressing, not only in the forested region of this State, but is equally important in Northern Minnesota and Michigan." Referring to the Bulletin mentioned he says:—"The studies here outlined have been confined to but one aspect of the problem—viz., the use of explosives, and represent work which has been undertaken co-operatively between this station, the Office of Farm Management of the United States Department of Agriculture, and the North-east Experiment Farm of the University of Minnesota."

We are receiving so many letters on this important subject that we think it will save much correspondence betwen farmers and the Queensland Department of Agriculture and Stock if we publish Mr. Kadonsky's Bulletin, in addition to what we have already done in this direction in this Journal. It needs but little travel through the agricultural districts of the State to convince anyone that there is just as urgent need for a cheap and effective method of clearing forest lands of stumps as there is in the United States, seeing that there are everywhere large areas of good forest land in all parts of the State which could be brought under profitable tillage by the use of explosives, but which cannot now be utilised, owing to the great expense of getting rid of the stumps by hand or machine labour, and of subsequent sub-soiling and draining.

"Explosives," says Mr. Kadonsky, "are used extensively in clearing new land in Wisconsin and Minnesota, especially in the regions with clay soils, once heavily timbered with pine. Explosives are now handled in many different ways, and there is great necessity of systematising and describing the best method of clearing lands by their aid. These explosives are used to extract stumps by breaking them to pieces and also to remove boulders. They may also play an important part in splitting and jarring off the soil from the roots in connection with mechanical power pulling stumps. The advantage of using explosives in clearing new land is, that a big investment is not necessary, as in the case of stumping machinery. Explosives can be used in some way by almost every settler. The stumps and boulders are left in such form as to be handled easily and disposed of. The roots are freed from soil, and the large parts so broken up that they may be used for fuel, as is the practice in many sections at present."

An explosion is the sudden transformation of a solid into a gas, which occupies a greater space. A common error is made by many practical men in thinking that the action of dynamite is downward, rather than being equal in all directions. It appears to act downward from the shattering effect on the soil or boulder, but the action upward is

just as great, only there is usually nothing visible to show it. The action on the soil chemically is not detrimental, as is commonly believed, but would rather tend to improve fertility.

KINDS OF EXPLOSIVES.

Two common kinds of explosives used in Wisconsin and Minnesota are dynamite and "virite." The dynamite ranges from 20 per cent. to 60 per cent. in strength, but the most universally used is 40 per cent. The 60 per cent. "straight" acts very rapidly with a shattering effect, while the 25 per cent. "extra" acts comparatively slowly with a propelling force. "Virite" is of only one strength, equal to 40 per cent. dynamite, as determined in the field, but much slower in action. The higher the strength, the speedier and more sensitive the dynamite. Those grades marked "extra" are slower in action, and should be used where a propelling force is desired.

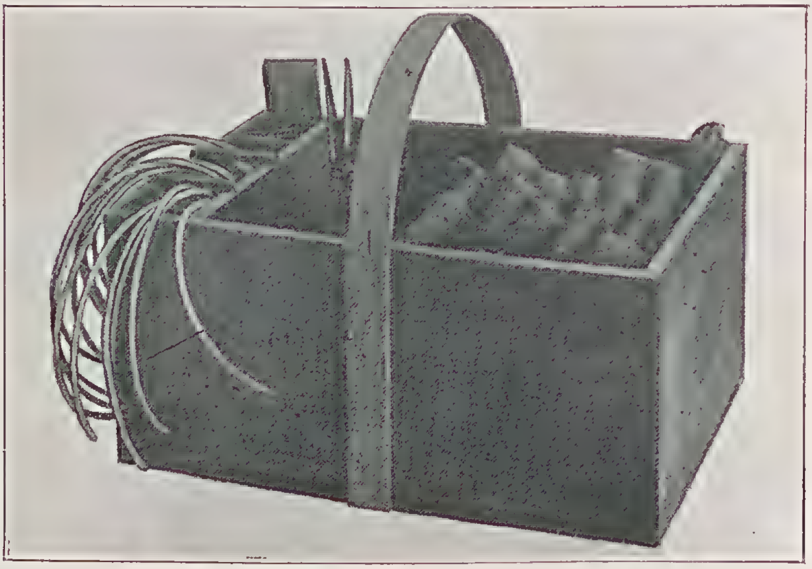


FIG. 1.—A handy box for carrying explosives, fuses, and caps. Compartments in one end provide for the caps and fuses.

It is very important to have the different grades of dynamite where shattering and propelling forces are required. In raising a boulder or a stump, a slow propelling force is best, but for breaking rocks or stumps, a speedy shattering force is necessary. Dynamite freezes easily, and when in that condition should be handled very carefully. When it is left in the hot sun during the summer it is rendered much more sensitive, and requires more precautions in working with it. The effects of the odour, or contact with dynamite, causes many operators to become sick. If a pair of canvas gloves is used in holding the cartridges, they can be discarded when they become saturated. Breathing the smoke or fumes should be entirely avoided.

Virite is comparatively more stable than dynamite. The latter can be almost always exploded by a ball from a rifle, while the virite would

remain intact. Virite is put up in bulk or cartridge form, and is non-freezing, and, consequently, can be used in the coldest climate without thawing. It has no odour which affects the operator, as in the case of dynamite, but the powder cannot be used in water unless confined in water-proof cartridges.

Handling Explosives.

Following is the equipment needed for blasting in the field:—A supply box, auger, crowbar, shovel, wooden ramrod, and a cap crimper. A supply box can be made on the farm by taking an empty dynamite box and placing a vertical partition across one end, leaving a space the width of an explosive cap box. At one end of this, make a compartment that will just admit a box of caps. The remainder of the space can be divided equally by ½-in. cross pieces, and each section *labelled* 18 *inches*, 20 *inches*, and 24 *inches*, respectively. The remainder of the box is used for explosives. Care should always be taken to keep the caps separated from the explosives. A wooden hoop may be nailed over this box for a handle, so that it balances when filled with supplies. (See Fig. 1.)

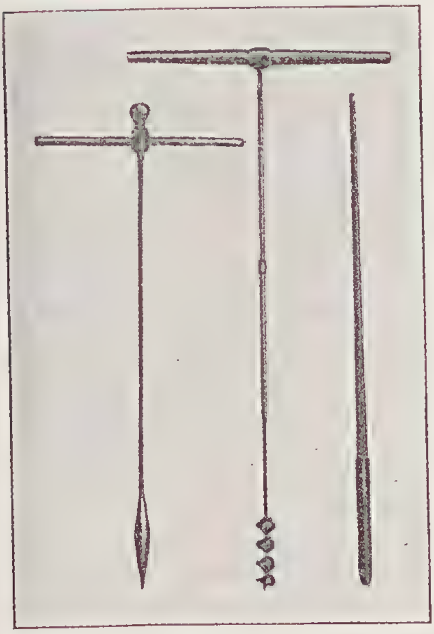


Fig. 2.—Three essential tools for preparing holes under stumps for blasting; large soil auger in the centre, a crowbar at the right and a pick at the left for opening a hole under the stump. Each is an important labour-saving device in placing explosives properly.

A convenient auger is made by welding a long shank into an ordinary 2-in. auger. Where the roots are not too numerous, and admit a larger auger, it would be advisable to use it. A medium-sized tapering crowbar should be used. The larger end should be drawn to an edge, and the other end to a blunt point. The ramrod can be made from an ordinary broom handle, and should be at least 3½ ft. long. These tools are shown in Figure 2.

A round-pointed shovel is best for removing the soil from the roots when loading and in filling in the hole when tamping the charge. A long tin funnel should be used to pour the virite, when in bulk, under the stump.

For making holes in the dynamite to receive the cap, a tapering hardwood stick, just a trifle smaller than the diameter of the cap, can be used. Attach this stick to a cord fastened to a trouser button where it will not be lost. Where the stumps are of uniform diameter, it is well to prepare the fuse of certain lengths before going into the field. Cut the fuse with a hand axe by laying it on a block on which a board is

nailed horizontally, and marked the desired lengths. We also carry with us a roll of fuse, which is cut in the field to meet exceptional cases. There are a good many ways of handling this fuse. Some people blast with only about 6-in. fuse, no matter how long the hole is, by lighting the short fuse, and dropping the dynamite on the rest of the charge, thus exploding without tamping. I do not approve of this method.

The end of the fuse should be cut square, not on a slant. If cut slantwise, the point, becoming dry and hard, is likely to explode the cap when inserted into it, or this point is likely to turn over in the cap and cause a misfire. The fuses are then inserted into the caps, and crimped with a crimper. Care should be taken that each cap is free from any foreign matter, since this will serve as a protection to the fire from the fuse and cause a misfire. The fuse should not be inserted into the cap too far, and should never touch the bottom, since this is very sensitive and may cause an explosion. When the end of the fuse enters the cap, and is crimped so that it just holds and withstands a reasonable amount of pulling during the process of tamping the charge, it is sufficient. The fulminate in the cap is so sensitive that it is exploded by the fire from the fuse when the end is nearly 1 in. outside the opening of the cap, if the fuse be directed into it. Do not expect the fuse to burn like a fire-cracker fuse. It is lit as soon as it gives a little spit of fire in answer to the match, but the outside cover of the fuse does not burn. Always retreat at least 100 ft. after lighting the fuse, until the charge explodes. Instances have been brought to my attention where the fuse was lit in the morning and hung fire all forenoon, and exploded about 11 o'clock.

PLACING THE CHARGE.

In blasting a stump, the charge is always placed *under* it in the soil, and *not in the wood* of the stump. To get to the desired point, it is necessary to make a hole with an auger or crowbar between the roots into the ground at the proper angle to get the charge in the centre of resistance. The hole should be made, if possible, between two prominent extending roots which come close together, as shown in Figure 3.

There are two reasons for this. First, there is less chance for the force to blow out of the hole, due to the resistance offered by these roots. Second, owing to the root distribution, there are generally no

FIG. 3.—Charges of explosives should be placed under stumps, at the centre of resistance. Using a long-handled soil auger, the hole may be bored between two large roots into the soil, under the centre of the stump, until the centre of resistance is reached.

FIG. 4.—When a small root stops the progress of the auger, a small piece of dynamite with fuse attached, dropped down into the hole against this root and exploded, will remove it effectively and make it easier to complete the boring of the hole.

roots immediately behind these, and consequently less chance to meet with obstacles in making the hole.

When a hole is started and the tool meets with an obstacle in the form of a small root or stone, such a resistance can often be removed by blasting. A piece of dynamite 1 in. long is used, and in the side of the paper wrapper, two cuts at right angles are made, into which a capped fuse about 4 in. long is inserted. This charge (shown in Fig. 4), which resembles a fire-cracker to some extent, is then lit and dropped down into the hole next to the obstruction, without tamping.

The force of this small explosion generally renders conditions such that the process of boring can be continued. This charge, costing only a couple of cents, often saves an hour's work, and also enables the charge to be placed where the maximum force will be received from the explosive. When the root formation is such that it is very difficult to get a large tool under the stump, a hole can often be made by driving the small end of the crowbar down so that the point terminates where the charge should be placed. Then, take a small piece of dynamite, about 1½ in. long, crumble it up, and drop it to the bottom of the hole. Try to get all, or as much as possible, of the powder to the bottom. A small stick can be used sometimes to get it down. Next, take a capped fuse about 4 in. long, drop it down upon the powder, and light. (See Fig. 5.)

FIG. 5.—When the soil is very hard under the stump and boring difficult, break up a cartridge and pour the loose powder into the hole, as shown above. Then with a cap attached to a fuse set off this small charge to open the way for the placing of a larger charge.

When properly carried out, this explosion will make a pocket under the stump, which will admit the desired charge. Should the passage be too small or curved, so as not to allow free passage of a cartridge, it should be crumbled and the contents poured down.

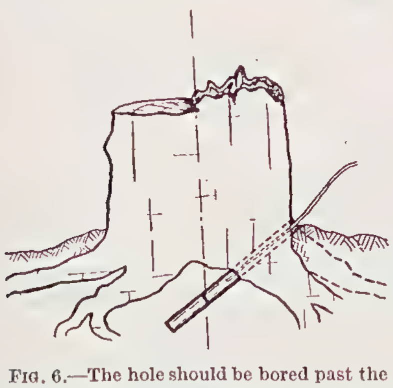


FIG. 6.—The hole should be bored past the centre of the stump sufficiently to allow the explosive to be placed across this centre as above, rather than on one side of it, as shown in Fig. 7.

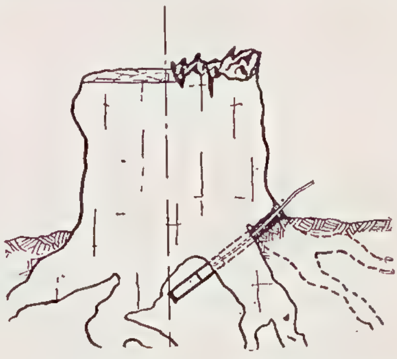


FIG. 7.—A common error in placing explosives is to bore the hole just to the centre of the stump and not beyond it. When the charge is placed at one side of the centre, it either merely blows off a part of the stump or forces away the soil at one side and does not remove the stump perfectly.

For an extremely large stump a big charge is necessary, placed in as compact form as possible. To do this, a pocket is blown at the bottom of the hole in the same manner as above in the case of removing an obstacle. Care should be taken not to get the pocket too large, so the dynamite cannot be tightly packed, which is absolutely necessary in order to get the best results. Virite, on the contrary, must have plenty of room, and must not be tamped under any circumstances. Where the dynamite cartridges are packed in the hole without breaking, leaving the explosive in a cylindrical form, the hole should be bored

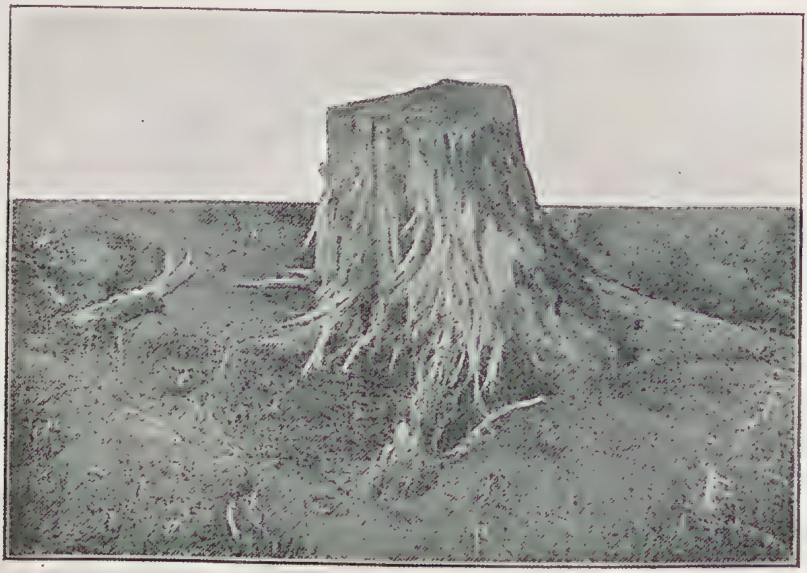


FIG. 8.—The charge was not properly centred under this stump, consequently the explosion removed one side and a part of the roots, leaving the rest of the stump in bad shape for further blasting.

past the centre of resistance, equal to half the length of the charge, which brings the bulk in the centre of resistance, as shown in Fig. 6.

The common way of placing the charge is to bore a hole *under* the stump at an angle of 45 degrees, terminating it at the centre of the stump, as shown in Fig. 7. When the cartridges are pressed down unbroken, the charge is then out of the centre of resistance, and, consequently, the results are not satisfactory.

Often, when boring a hole, an obstacle is met with before reaching the centre of resistance, the operator places the charge, increasing the amount of powder, believing this will do the work as well as when properly placed. This, however, is not the case. The side of the stump is blown away, cutting the roots, leaving almost all of them and half of the stump behind, as shown in Fig. 8.

It is necessary to emphasise this point. Place the charge far enough under the stump, in the centre of resistance, but not always necessarily under the centre of the stump. Time is well spent in putting forth extra effort in doing so. When a stump is located on a slope, the centre of resistance and the centre of the stump are not the same; hence, when

the charge is placed under the centre of the stump, only part of it is blown out. Here the resistance is greater toward the higher slope, and, consequently, the charge must pass the centre of the stump to get it in the centre of resistance, as shown in Fig. 9.

Fig. 9.—When stumps stand upon a hill side, the centre of resistance is up-hill from the centre of the stump. The distances, A and B, should be about equal, so that the charge will not blow out of the lower side of the stump.

Often the root formation is greater on one side than on the other, and when the charge is placed under the centre of the stump, the force takes the path of least resistance, shooting out at one side. (See Fig. 10.) To remedy this, place the charge over toward this heavy root formation,

Fig. 10.—An explosion of a charge improperly placed at one side of the centre of the stump. Note that the main force of the explosion is going out to one side.

as in Fig. 11, which will bring it in the centre of resistance, and give better results. Sometimes the nature of the soil on one side of the stump is such that it offers more resistance than that on the other, which must also be taken into consideration when blasting.

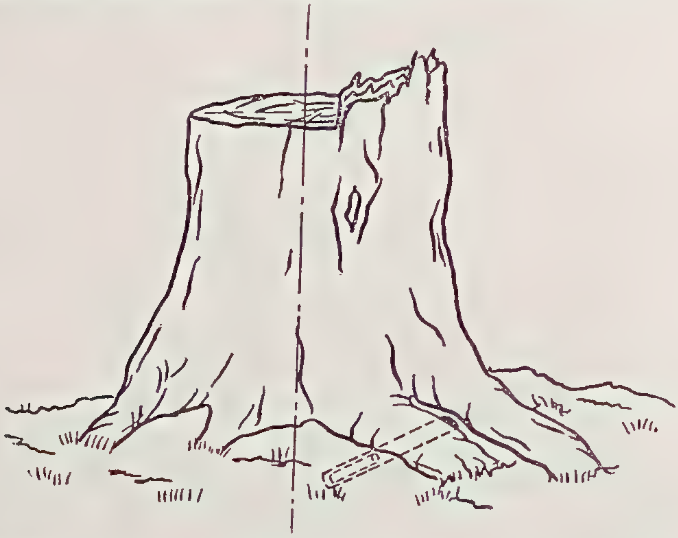


FIG. 11.—When a stump has unusually large roots on one side, a charge of explosive should be placed upon the side of the centre of the stump towards these roots.

DEEP CHARGES UNNECESSARY.

The depth at which the charge should be placed is also very important, and on this point varied opinions are held by different operators. It has been found by placing a charge at a comparatively great depth, as advocated by many, that it required a greater amount of explosive, and the results obtained were not so satisfactory as when less powder

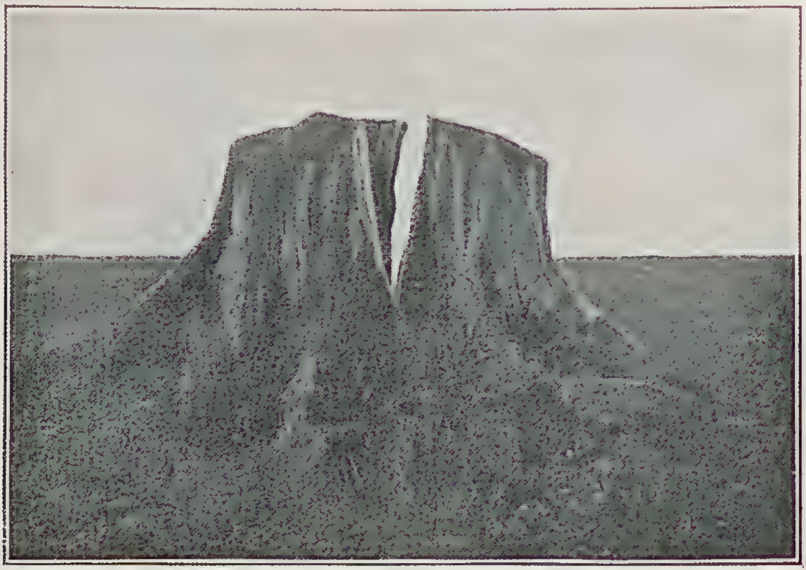


FIG. 12.—When a charge is placed too deep in clay soil below the stump the result is that the stump is merely split, as shown here. In sand, the soil is merely blown away, as shown in Figure 13. While the charge should be in the soil under the stump, it should be as close to the wood as it can be placed

was used at less depth. The cost was greater, the stump was not broken up and freed from soil, and larger holes were left to be filled, when the charge was placed deep. This is due to the fact that by placing the charge some distance in the soil below the base of the stump, a large mass of soil must be raised, which also serves as a protection to the stump. When an ordinary charge is deeply placed in a clay soil, the result is a pear-shaped hole in the soil, and a split stump through which the gases escape, like the one in Fig. 12.

FIG. 13.—When a charge is placed too deep in light sandy soil, the force of the explosive blows away the soil and leaves the stump standing as shown here.

In light sandy soil the gases tend to blow out on either side of the stump between the roots, when the charge is deep, leaving the stump in place, as in Fig. 13.

This is due to the greater ease with which the force can escape at some distance below the base of the stump, where there is a greater spread of roots than farther above. Care should also be taken not to place the explosive too shallow. If the charge is not deep enough, and the head of the stump is weak, the result is that the top of the stump is blown off, cutting and leaving the roots above the plough line, like those in Fig. 14.

FIG. 14.—When a stump has a weak top and the charge is placed too shallow, the result of the explosion is that the head of the stump is blown away, as shown here, leaving the large roots above the plough line in a position very hard to remove.

It is difficult to set any hard-and-fast rules regarding the depth at which the charge should be placed under the stump. The operator must use his judgment in each individual case, but place the explosive as shallow as possible, avoiding cutting off any part of the stump above the plough line. This will give the best and most economical results. As a rule, it is best to place the explosive in a bulk form, breaking up the cartridges, especially when blasting large stumps. The force then radiates equally from one central point, and splits the stump into the maximum number of parts. When the charge is in the cylindrical form, most of the force acts at right angles to it and generally splits the stump into two parts.

HINTS ON PLACING CHARGES.

There are a few things which should be observed about loading to save time and get the best results. When the hole for the charge is large, it is well to take the powder out of the cartridge, and tamp it well into a bulk form. The paper wrappers should also be included, since these, which are saturated with nitro-glycerine, are also explosive. The quickest and a most satisfactory way is to cut the wrapper lengthwise into four parts with a sharp knife, as shown in Fig. 15.

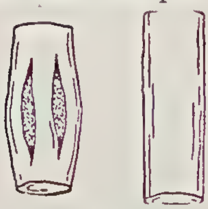


FIG 15.—Slitting the wrapper enables the charge to be pressed compactly in the hole.

When this cut cartridge reaches the bottom of the hole, and is pressed with the ramrod, it bulges and crumples into a mass. When placed in a cylindrical hole, the cut parts bulge out so as to fill the opening completely, thus making the charge compact, which is desirable. (See Fig. 16.) Into the last part of the charge, the fuse with cap crimped on to the end should be placed. If an ordinary fuse is used a very quick and satisfactory way is to hold the cartridge in the left hand and make a hole with a pointed stick slightly smaller than the diameter of the cap in the side near one end at an angle of 30 degrees. The cap is then pressed into it so that it is buried in the powder, and the fuse bent back to form a sort of hook with the cap as a point. (See Fig. 17.) This is passed down the hole to the remainder of the charge, and the fuse can stand a reasonable amount of pulling without coming out, but rather tends to go farther into the cartridge. The cap on an electric fuse can be inserted in the same manner, but the wires should be looped round the cartridge.

FIG. 16.—When pressing the cartridge nto the hole, always use a wooden ramrod, never a metal crowbar, and press the cartridge hard enough to make it compact. The explosion will then be complete and effective.

Care should be taken not to tamp the part with the cap, but to press it gently. The other part of the charge must be tamped well if dynamite is used, but with virite it must always be left in an absolutely loose

form. The charge is generally tamped with soil, which is brought up with the tool in boring the hole, or with any loose soil which may be at hand. Always use a wooden ramrod in placing and tamping the explosives, and *never place any metallic tool down the hole near the charge under any circumstances.*

When the operator has had some experience and knows the approximate amount of explosive required for a stump, it is well to load a large number and fire them at one time. This saves time and miles of travel if one blasts all day and fires each one after loading. A good way is to load for half a day, and fire them during the noon and evening hour, when the rest of the workmen are not present.

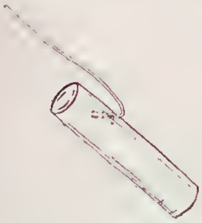


FIG. 17.—The capped end of the fuse is inserted hook-fashion into upper end of cartridge.

RELATION OF EXPLOSIVE TO SUBSOIL.

Each kind of soil requires a particular kind of explosive. It has been found that in the clay soils a slow propelling force is the most satisfactory, which is furnished in dynamite of 27 to 30 per cent. strength. This explosive, acting slowly, removes the roots without snapping them off above the plough line, leaving the soil in a comparatively loose condition, as shown in Fig. 18, which is very important from a physical standpoint.

FIG. 18.—A dynamite of moderate strength, about 27 per cent., will leave the clay soil in a loose, crumbly condition, as shown here, which is desirable rather than compacting it too much, as shown in Figure 19.

When a speedy powder is used, as 60 per cent. strength, on the clay soil it snaps many of the roots, leaving them above the plough line,

and packing the soil firmly, leaving a sort of basin, like that shown in Fig. 19.

For the light sandy soil, where the footing is not good and there is a chance for the gases to escape, a speedy force should be used, equal to 60 per cent. dynamite. The condition of the soil with respect to moisture regulates, to a great extent, the amount of explosive required per stump. Owing to a great variation in the structure of stumps, and soil conditions, it is impossible to give any definite information as to the amount of powder necessary to blast a stump of a given size. This must be regulated by the experience of the operator. Extremely loud reports and the throwing of the parts of the stump great distances is

FIG. 19.—The effect of a charge of 60 per cent. dynamite on red clay is to pack the soil solidly and to leave a large basin, which must be filled and levelled before the land can be ploughed.

an indication of an excessive use of explosives. A deadened report following the explosion, the splitting and lifting of the stump just out of the ground, shows the most economical use of the explosive.

METHOD OF FIRING CHARGES.

The most common way is to split the end of the fuse to expose the powder, which is lit with a match. Some place a pinch of dynamite on the end of the fuse. The quickest and most satisfactory way when matches are used is to thrust the head of a safety match, whose chemical part is just starting to burn, into the end of the fuse. This never fails to fire, no matter how much the wind blows. It is well to scratch the match on an adjacent root or the sole of the shoe, so that the head of the match cannot burn long before being thrust into the fuse, which is very important in this method. Where a large number of

stumps are to be fired at once, a live brand or an iron rod, 1 inch thick and about 3 feet long, heated in a burning rubbish pile, is recommended.

The safest and perhaps the best means of firing is to use an electric blasting machine for that purpose. An electric blasting machine consists of several electric dry batteries arranged in a box for convenience of carrying, and connected with a switch which must be closed in order to fire the charge. It is fitted with screw binding posts for convenience in connecting the machine into the circuit with the powder. A number of stumps close together can be fired simultaneously. The cap of the electric fuse is placed in the cartridge in the same way as the cap on the time fuse, only the wire is looped round the cartridge. The wires running to the cap should be long enough so that they will project out of the hole when the charge is tamped. Connect one of the cap-wires to a long wire running to the machine, 200 feet away. Connect the other cap-wire to an insulated wire running to the next stump, and so on through all convenient charges back to the blasting machine to complete the circuit. The method is illustrated in Fig. 20. The charges are fired by closing the switch.

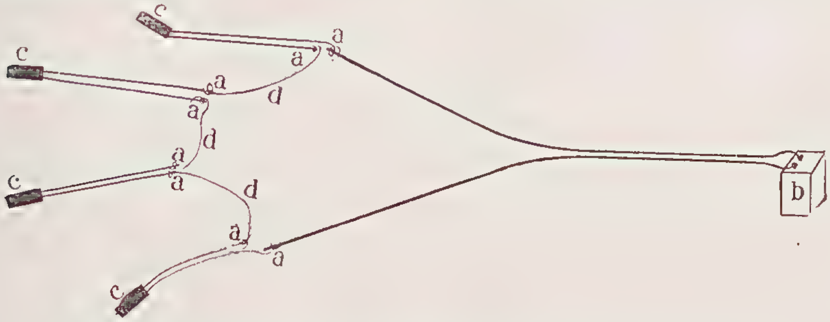


FIG. 20.—Method of blasting several stumps at once; *b* represents electric blasting machine; *c* a charge at a stump connected by the cap-wire into the circuit at *a*; *d* represents an insulated wire connecting one charge with another.

Care should always be taken to have the wires disconnected at the battery while preparing the charges. Electric firing has advantages over time fuse in that accidents are less likely to occur, the chance for misfires is reduced, and there is a saving of time by blasting a number of stumps simultaneously. Often two or more adjacent charges must be fired at once to get the best results, which is possible only by the use of electricity.

CAUSES OF MISFIRES.

Misfires are due principally to the presence of foreign material in the cap; pulling the fuse out of the cap; pulling the cap out of the powder; or to a defective fuse. Perhaps the most serious accidents occur when a time fuse burns to a certain point and then, owing to some defect, burns very slowly for a few minutes. The operator, after waiting for what he considers a long time, approaches the stump, when the explosion takes place, with serious results to himself.

A misfire should be left until one is absolutely certain that it will not explode. Do not go near it till the following day. Then it can be

treated by making a hole or removing the tamping toward the charge carefully, but not coming in contact with it. A small charge is then placed near the first, which upon exploding generally sets off the first charge.

BLASTING BOULDERS.

In blasting boulders, the aim is to throw them above the surface and break them into smaller parts, so that they can be handled easily. For raising these masses, a slow propelling force should be used. The charge should be placed under one end of the boulder, at a point where a pry would be placed if it were to be raised in this manner. A pocket for this charge can be made under the rock by means of a long-handled, pointed shovel. The explosive should come in contact with the boulder and have a flat ground surface parallel to the rock surface with which it is in contact, to work against. To break a rock on the surface, a very speedy explosive, as 60 per cent. dynamite, is most satisfactory. It can be placed on the mass and covered with wet soil. The most effective way is to get the charge into a crevice or hole in the surface of the boulder if possible.

EXAMINATION OF QUEENSLAND COTTON.

In August, 1911, the Department of Agriculture and Stock forwarded samples of Queensland cotton, supplied by Messrs. Joyce Bros., of Ipswich Cotton Mills, to the Imperial Institute for examination and report on their value. Owing to a misunderstanding, the samples were forwarded to the Glasgow Exhibition. Hence the delay in the receipt of the report, which is as follows:—

RESULTS OF THE EXAMINATION OF QUEENSLAND COTTON.

IMPERIAL INSTITUTE.

No. 40,928. Date, 24th May, 1912.

Reference.—Letter dated 17th August, 1911, from the Under Secretary of the Department of Agriculture, Brisbane.

Number or Mark and Weight of Sample.—Cotton from Queensland. Weight, unginned cotton 28 lb., ginned cotton 6 lb.

Variety of Cotton.—Not stated.

Description.—(1) Ginned, (2) unginned.

Lint.—Clean, fairly lustrous, slightly harsh, white and free from stains. Yield of lint on ginning, 34.15 per cent. Yield of lint per 100 seeds, 7.0 grams.

Seeds.—Fairly large, smooth, brown seeds, each bearing a tuft of down, and a spike at the pointed end.

Strength.—Poor.

Length of Fibres.—From 0.7 to 1.3 inch; mostly from 0.9 to 1.1 inch.

Diameter of Fibres.—From 0.0006 to 0.0011 inch; average, 0.00082 inch.

Microscopical Characters.—Most of the fibres exhibited a good twist.

Commercial Valuation.—From 6.80d. to 6.90d. per lb., ginned, with "middling" American at 6.46d. per lb.

Remarks.—This cotton was of good colour, rather harsh and coarse, and decidedly weak. It was classed by the brokers as of "barely good middling grade."

THE FARMERS' SHEEP.

By W. G. BROWN, Sheep and Wool Expert.

Twenty-five years ago the pastoralist, pure and simple, was supreme on the Darling Downs, and the farmer had a hard struggle to make ends meet, if he stayed on his holding. He was, therefore, forced to go away to seek a living at shearing, fencing, dam-sinking, &c., on the big holdings of the Downs and the West. With few exceptions, the flocks consisted of merinos; and wool-growing was the primary consideration.

In the natural course, increased and increasing population caused land values to rise, and coincident with that process, prices for fine wool and stock fell so low that the pastoralist found it difficult to make ends meet.

It may be postulated that when land rises in value above £2 per acre it does not pay the holder, even at the present high prices, to graze sheep on natural grasses.

Suffering at each end of the wool-growing business, therefore, the pastoralist was forced to cut up his big estate—it was inevitable—and the number of farmers increased by leaps and bounds. At first, these subdivisions were run on purely agricultural lines, and in the majority of cases it was found to be a very precarious business. With the advent of dairying, however, everything was changed, and the farmer began to thrive as he had never thriven before. One consequence was that he and his sons, instead of going out to the shearing-sheds, and other pastoral work, remained at home, and, in time, the children acquired land themselves, and went in for the dairying business. Thus a bigger demand for land than ever was produced, the process being helped by the advent of the New Zealanders and the Southerners. As a consequence, values have risen, until to-day it is safe to say that arable land in the farming districts is at least five times more expensive than, say, twenty years ago, and the process is still going on.

All countries, in their turn, have been forced to face the problem of how best to deal with land when they have passed the purely hunting and pastoral stage, and as far as the coastal districts are concerned, Queensland is now face to face with it. In Britain, the question was solved 150 years ago; America followed suit within the past thirty years; the Southern States of the Commonwealth about fifteen years ago, and New Zealand somewhat earlier than Australia. The answer to

the question of how to deal with high-priced land to the best advantage is—" mixed farming," cultivation—with stock. In Britain there are more sheep than Queensland possesses, although there is a difference of 35,000,000 in population, on an area, in Britain's case, of less than one-tenth of that of Queensland. In New Zealand, mixed farming is carried on successfully by farmers who have paid upwards of £40 per acre for their land, and a similar state of affairs prevails in Victoria and South Australia. It is plain that Queensland farmers must follow their lead on the land which is yearly increasing in value, and it is the aim of these articles to point out what has been done elsewhere, with the modifications which our differing conditions require.

Well, then—supposing a Queensland farmer decides to take up mixed farming. What shall he do? He may dairy; he may breed horses or beef cattle; he may breed pigs or sheep.

With dairying he must keep pigs; horses and cattle together will do well; sheep and cattle do not do well together.

The choice will depend, of course, upon the man. With dairying, horses, pigs, or cattle these articles have nothing to do. It is to the sheep-farmer or the would-be sheep-farmer they are addressed.

Fortunately for the sheep-farmer, there is a vast fund of theoretical and practical knowledge to draw upon. For over 150 years the Britishers have been working their land, as " mixed farms"; the New Zealanders and the Southern States have been exporting millions of fat sheep and lambs for many years, have been working along every conceivable line of breeding and feeding, and have practically reached perfection. All the results are on record, and it seems as if four questions stand out, as thus:—

1st: What kind of sheep is most suitable?

2nd: What shall they be fed upon?

3rd: How shall they be handled?

4th: What should be the result financially?

First: What kind of sheep is most suitable?

According to Professor Bowman, in his " Structure of the Wool Fibre," there are eleven varieties of sheep known, with thirty-nine sub-varieties, but experience has shown that of all these, not more than a dozen show qualities which would recommend them to Australians or New Zealanders. Of these about nine are well known, and these are divided into three classes, viz.:—

Merino Long-wools Short-wooled or Downs' breed.

We shall take them in the order given, first stating the qualifications necessary to excellence in a farmer's sheep.

It should be a dual-purpose animal. That is, it should be bred primarily for mutton, with as valuable a fleece as possible.

It should mature as early as possible.

It must be strong in constitution.

It must be prolific.

The merino is the first, and, to Australians, the most important. In its pure state it is distinctly not a farmer's sheep. It is essentially a wool-producer, carcass being secondary to fleece, and, as stated above, the farmer's sheep should be bred primarily for mutton. It is the slowest in maturing of any breed, and is a dainty feeder, doing ill on feed upon which the British breeds will flourish. A farmer's sheep should be a gross feeder. On rich country, with an abundant rainfall, it does ill. Yet, because of its beautiful wool, and its power to transmit fleece quality to the cross with any other breed, it is essential in the production of the dual-purpose sheep. One parent in any cross-bred sheep must be Merino, whatever other be used. That fact is beyond argument now in Australia.

Next come the long-wools. There are four main breeds of these:—

The Lincoln, The English or New Leicester, The Border Leicester, The Rowney Marsh.

THE LINCOLN.

Like the Merino, the Lincoln has a history whose beginnings go back into very ancient times. It has a big body, with big head, big bones, big fleece with coarse fibre, yet a true wool, with great relative length of staple. It is not as early a maturing animal as others of the British breeds, but, as compensation, carries its vigour into an age when most others are decrepit and valueless. For wool and mutton the first cross on the Merino has come to be recognised as being one of the best.

The "Australasian," of Victoria, recently issued a series of questions to the leading sheep-farmers of Victoria, asking for opinions on matters pertaining to mixed farming. Thirty-one replies were received, and in three of them—What is the best breed for (*a*) wool-growing, (*b*) lamb-raising, (*c*) for wool and lambs?—Lincoln received twenty votes, while the remaining eleven votes were spread over six other breeds. In the case of using Lincolns, it was a condition in most of the verdicts for that breed that a big, plain-bodied, Merino ewe should be used as the mother.

THE LEICESTER.

The Leicester, properly called the New or English Leicester, is, in figure, hardihood, and quality, both for wool and mutton, almost unrivalled. It originated about 100 years ago with a Mr. Bakewell, who obtained it by judicious selection of various long-woolled sheep and the old Leicester breed, which is now nearly extinct. As compared with the Lincoln, its skin is soft, thin, and elastic, with a fair quantity of white lustrous wool, finer than other long wools, although not as long as they. The Leicester is noted for a greater proportion of dead to live weight than any other breed.

Fine hair and fine bone in any animal presupposes fine constitution, therefore this breed is not as robust as its coarser-organised rival, the Lincoln, and is more dainty in its choice of feed. It matures much earlier than the Lincoln, and is very prolific.

(TO BE CONTINUED.)

BOYS' POTATO CLUBS.

In the United States of America, every incentive is given to young people in the rural districts to enter upon a course of practical agriculture on their own initiative. One of the popular institutions, particularly in Utah, is an organisation of boys into clubs, the members of which vie with each other in the production of crops of various kinds. The great value of these clubs lies in the preparation of young people on their parents' farms for a future successful career in agricultural pursuits

Amongst these clubs are the "Boys' Potato Clubs," which have proved eminently successful, in the same way as do similar "Corn Clubs" in the Eastern States.

We have just received from the Utah Agricultural College Experiment Station, a circular (No. 5, Extension Division) giving details of the constitution of these clubs, together with instruction in potato-growing. The conditions under which the cultivation of the potato is carried on in the Western States naturally differ from those under which the tuber is grown in Queensland, where two crops are harvested annually, and where "freezing" conditions are practically unknown, although frosts occur during the winter season.

The institution of boys' clubs should commend itself to our boys, seeing that the State school teachers are all trained yearly at the Queensland Agricultural College, at Gatton, when they study not only agriculture, but dairying, stock-raising, &c. The knowledge thus gained is imparted to their scholars, and at nearly all the country State schools there are scholars' gardens, where the boys and girls very successfully put into practice what they learn from their teachers. Following is

THE CONSTITUTION

of the Boys' Potato Clubs in the State of Utah:—

Constitution.

Article I.—Name of club.

Article II.—Object of club.

Article III.—Membership (including badge or button, and a provision for honorary member, if desired).

Article IV.—Officers: (A president, one vice-president from each school district, a secretary-treasurer, and an advisory committee consisting of the county school superintendent, the president of the County Farmers' Club, and a member of the staff of the Agricultural College Extension Division.)

Article V.—Duties of members. (As described in the rules for contests.)

Article VI.—Duties of officers. (Defined as usual in such organisations.)

Section.—The Advisory Committee shall arrange for all public contests and exhibits, the procuring and forwarding of prizes, the sending of letters and circulars of information and general county meetings of the club.

Article VII.—Subsidiary clubs.

Each local school having ten club members within its district may organise as a local club with its own officers, badge, local prizes, &c. Its advisory committee shall consist of the district school board and teachers, and its president shall be one of the vice-presidents of the county club.

MEMBERSHIP CARD.

I wish to join the County Club, and hereby promise to follow all the rules of membership and contests.

Age at nearest birthday Date of birth 19 .

Township:

School District:

Post Office Address:

Box No. R. F. D.

The members of a potato-growing club keep a careful record of all work done in connection with the annual contest.

HOW THE CROP WAS GROWN.

1. Grown by: School District:
2. Post Office Address:
3. Area of plat in square rods: (½ acre.)
4. Kind of soil (loam, sand, clay):
5. Kind of crop grown on it the year before:
6. Kind of crop grown on it second year before:
7. Kind and amount of manure used:
8. Cost or value of manure:
   When applied:
9. Date of ploughing:
   Hours required—Self: Horse:
   If two horses are used, count as twice the time of one horse.
10. Depth of ploughing (in inches):
11. Additional preparation of ground—
    (*a*) How many times disked: When:
    (*b*) How many times harrowed: When:
    (*c*) How otherwise prepared:
    (*d*) Total hours work of preparation—Self:
    Horse: If two horses are used, count as twice the time of one horse.
12. Kind of potatoes planted:
    Variety name:
13. Seed secured from:
14. Number of hills planted: Date: 19 .
15. Number of irrigations: Date: 19 .
    Hours worked:

HOW THE CROP WAS GROWN—*continued.*

16. How was seed cut?
17. Was seed treated for scab? How?
18. Date when first hills came up:
19. Number of hills failing to come up:
    Why?
20. Date of each cultivation and implements used:
21. Total hours cultivation—Self: Horse:
22. Dates of hoeing crop: 19 .
    Hours worked:
23. Date of blooming:
24. Date of harvest:
25. Dates of any frosts on the crop: 19 .
26. Method of harvest:
27. Number of bushels of good potatoes:
28. Number of bushels of small potatoes:
29. Diseases present:
30. Was the selecting done without any other person present:
31. Was all the work of production done by the contestant (except plowing, weighing, and hauling the crop)?
32. Total number of hours worked:
33. Total number of hours horse worked:
34. Value of own work at cents per hour, $:
35. Value of horse's work at cents per hour, $:
36. Value of ground rent for crop at per acre:
37. Value of manure used, $:
38. Value of saleable crop at cents per bushel:
39. Profit on the season's work, $:

In addition to the foregoing record, which should accompany the exhibit offered by the contestant, an essay covering the same facts in a connected description is required.

RULES FOR CONTESTANTS.

1. Each contestant is allowed to make an exhibit of best 50 lb. and best dozen tubers each year.

2. Each contestant must be regularly enrolled in the County Club before beginning work.

3. Each contestant must be either a regular student in the District or High Schools of the county, and must be under 16 years of age.

4. Each contestant for prizes must prepare his ground, plant, cultivate and irrigate all, without assistance from any other person. (He may have assistance in ploughing, manuring, and hauling crop, and should have in weighing it.)

5. Each contestant must study the score card.

6. Each contestant shall write an essay of not more than 1,000 words, and must carefully fill the blanks on "How the crop was grown."

7. Each contestant's record and essay must be endorsed, with his exhibit, by his principal as evidence of confidence that it is all the product of his own work.

8. The following instructions will be useful in making selection of potatoes for the contest, and for exhibition purposes.

SCORE CARD FOR POTATOES.

Variety Name ____________	Value.	Score.
Uniformity of Exhibit	20	
Trueness of Type	10	
Shape of Tuber	15	
Size of Tuber	15	
Eyes	5	
Skin	5	
Texture of Tuber	5	
Soundness	10	
Freedom from Blemishes	15	
TOTAL	100	

Contestant's Name ____________

Date ____________

Explanation of Score Card.

Uniformity of Exhibit.—Select twelve potatoes that are uniform in size, colour, shape, and which have uniformly well-defined eyes of the same depth, also as nearly as you can the best fifty lb.

Trueness of Type.—Each potato should be typical of the variety to which it belongs—*i.e.*, the characteristics should be clearly defined, enabling one to easily identify it.

Shape of Tuber.—The shape of the potato will depend largely upon variety, but the flat, round, or oval shape is favoured, because these shapes usually give best quality tubers.

Size of Tuber.—As a rule, select medium-sized potatoes, but if two exhibits are otherwise equal, choose the larger, unless potatoes are so large as to be considered overgrown.

Eyes.—The eyes of the potato should be medium deep, well defined, and not too numerous. Deep eyes cause waste in peeling, and have a tendency to affect shape of tuber. Eyes too shallow are low in vitality.

Skin.—The skin may be whitish, brown, reddish, yellowish-brown, blue, or black, depending on variety. It may be thick or thin, tough or brittle. A thick, fairly tough skin is preferred, lenticels not too prominent, or potatoes sunburned.

Texture of Tuber.—This is determined by cutting tuber. A fairly fine-grained, brittle texture is preferred. A tough texture does not cook up mealy, and is usually poor in flavour.

Soundness.—Select potatoes that are sound and firm, not wrinkled and flabby. Hollow potatoes are objectionable, likewise any internal discolouration indicating a diseased condition. The judge should cut two potatoes in each exhibit.

FREEDOM FROM BLEMISHES.

The judge will deduct from score for scab spots, or skin ruptures from any other diseases, cuts, bruises, scratches, or any other defects.

HOW TO SELECT POTATOES FOR CONTEST AND EXHIBITION.

First study the score card, which is used as a standard by which the exhibitors and judges can be guided. As soon as you are familiar with the points which make up a good exhibit, place the potatoes which have been chosen as worthy of consideration on a table before you, and carefully select the twelve best tubers which conform to the score card, and also the best 50 lb.

PACKING POTATOES TO SEND TO CONTEST.

As soon as the final selection has been made, each potato for the best dozen should be wrapped in paper and placed in a box just large enough to nicely contain the twelve potatoes, so that they will not move or roll about and become bruised in handling. The box should be lined with two or three thicknesses of newspaper to prevent freezing during shipment.

The best 50-lb. exhibit should be carefully sacked, tied, and handled, so as to avoid bruising.

PRIZES.

Local, County, and State prizes will be given for the largest yield of good marketable potatoes. Local and County first and second prizes will also be given for best 50 lb., best dozen potatoes grown by the contestant, and also for the best essay on potato-growing, as explained in the rules of contest.

SILOS.

The "Queenslander Herald and Nord-Australiche Zeitung" of 3rd July, writes as follows on the question of silos:—

"The word 'Silo' or 'Ensilage,' which has been of late so much discussed, is probably even yet, amongst our farmers and graziers, somewhat hazy. Everyone knows that it is a matter of a new method conservation of fodder, and, as all new ideas are often mistrusted, the interest in the question is slow of acceptation. And yet ensilage is neither something very new, nor is the distrust of it justified. It is known that it deals with a new method of forage conservation, and, as all new ideas are generally looked upon with suspicion, very slight interest is taken in it. Yet ensilage is neither something very new, nor is there any

justification for mistrusting it, as may be deduced from the fact that its practical value is answered for by farmers and the State Department of Agriculture. Clearly ensilage has long since passed out of the experimental stage, and so well approved itself in many cases that the only wonder is that greater attention has not been paid to this method of fodder conservation here, where dry weather conditions play so important a part in farm life, for it is especially for such seasons, bringing with them the scarcity of green fodder, that ensilage comes in to secure a partial compensation.

"All fodder plants contain a more or less percentage of starch, sugar, and gum, which constitute their nourishing properties, and furthermore they contain sundry salts and a certain quantity of water conditional to and increasing the digestibility of the fodder. Under the old method of fodder conservation—that is, turning it into hay—a large portion of this water is evaporated, and consequently with it much of its digestibility, with the result that hay-fed cattle suffered by want of nourishment, and dairy cattle especially yielded far less milk.

"Now ensilage endeavours to retain the moisture in the fodder, and this is achieved by preventing as much as possible the access of dry air, which is exactly the reverse of the preservation of hay, which demands as a first requisite a dry atmosphere. And here we have an advantage presented by the establishment of the silo. Whilst, formerly, the hay harvest and its result depended so much on the weather that the farmer looked upon every rain cloud as a threatening spectre, the making of ensilage is entirely independent of weather conditions; indeed, moist weather is preferred by many farmers when making ensilage, seeing that a larger moisture content in the fodder is considered beneficial during manufacture, the process of which is generally as follows:—

"The green forage is cut in the usual manner, preferably before having arrived at full maturity. The silo into which it is placed may be constructed in several ways, either in the form of a pit in the ground or built up in the shape of a round or square tower. Latterly silos have been built of concrete, which is said to adapt itself well to the purpose, but this is more costly.

"Equally good for the purpose, and comparatively cheap to construct, for the average farmer is a wooden building, the size of which will of course depend on the quantity of fodder to be ensiled. In Australia there are silos of from 40 to 100 tons capacity.

"For a description of the method of building a wooden silo, the reader is referred to the issue of the 'Queensland Agricultural Journal' for July, 1907. A great advantage is gained by the farmer who can afford to build two silos, as he can then continue to fill them without delay. The fodder (chaffed) is emptied into the silo and firmly trodden down. After a day's work, the silage is left for a while to settle further by its own weight. Should there be more than one silo, the filling of the second may be proceeded with next day, and on the third day the first silo may be further filled, and so on until both are

filled, being finally covered with planks or hay. Now there begins inside the silo, owing to the moist heat, a kind of fermentation of the fodder, which very shortly imparts to it a brown colour, without, however, removing any of its juicy constituents. In a few weeks the contents of the silo sink often as much as 10 feet, when, should the silage not be immediately needed, the vacant space can be filled with fresh fodder. When the time arrives, when scarcity of green feed necessitates a resort to the silo, the cattle should be gradually accustomed to the new fodder by mixing it at first in small quantities, gradually increasing, with chaff and hay. Much as the cattle at first object to silage, once they are accustomed to it, they devour it greedily, and the advantage of the fodder is soon proved by the increasing yield of milk. There is another important matter to be pointed out. Certain plants, herbs, &c., which cattle will not eat in a green state, they will willingly eat after they have been prepared in a silo. Such plants are the marsh mallow, thistles, weeds of all kinds, and even the *Arundo phragmites* which grows in the swamps.

"Considering all the advantages of a silo, the cost of erection is comparatively small. The expense naturally depends upon the material used, and with respect to a wooden building the cost depends on the price of timber and labour. On the average, a wooden silo to hold 40 tons would cost about £30, and if two are built simultaneously the cost would be reduced to about £25 each. This does not in any way prohibit the construction of cheaper silos, nor of a more costly building with arrangements for filling and emptying it. We advise our countrymen to further study this method of fodder conservation.

"In conclusion, we may add a very interesting instance at the Queensland Agricultural College. There, since last December, 403 tons of fodder were made into silage. This quantity suffices to keep 50 cows in fodder for 328 days. The conservation of fodder has been taken up there in earnest, and the silo has come to stay—a proof that its great value is recognised there."

"STOVING" OUT TIMBER.

By G. B. BROOKS, Instructor in Agriculture.

The stump-jump disc plough, cultivator, and seed drill have made the question of stumping the land, more especially in cereal-growing districts, of much less concern than was hitherto the case. We find that extensive areas of box, brigalow, and belah country are cleared for the plough simply by burning off the timber level with the ground. In heavily-timbered forest country, where the land is intended for maize, potatoes, and other crops requiring thorough and constant cultivation, the removal of stumps and roots is a necessity.

Many settlers go to unnecessary expense in the burning off and the grubbing out of dead timber that could have been more cheaply and effectively got rid of by the method known as "stoving."

In "stoving out," the first operation is to open up a narrow trench close to the tree, the width varying according to size—say 12 in. for a medium, and 18 in. for a very large stump. In opening up around small trees or stumps, a shovel is seldom required, the mattock alone being quite sufficient.

The depth of the trench depends largely on the root system. To uncover the upper portion of the root is, however, generally sufficient. In the case of hard-burning trees it will be advisable to go somewhat deeper.

The opened-up trench is now filled up with small timber—1 to 3 in. in diameter, and from 12 to 18 in. long; the filling up to be a little higher than the level of the ground. The more closely the packing is done, the more effective will the process be. To complete the operation, the packing should be covered up with sods, which can generally be secured adjacent to the tree or stump. If only a few stumps are being stoved out, the sods required can be dug out with a mattock or shovel; but when extensive areas are being worked, this method will be altogether too slow. The more expeditious way is to use a plough set to cut 2 to 3 in. deep, and which will in a very short time give sufficient sods to burn off several acres.

The sods can then be handled with a fork, care being taken when placing them around the tree to see that they slightly overlap, which will prevent their opening up during the burning process. A small opening should be left uncovered in the windward side for firing, and when well alight this should also be closed up.

Further attention is seldom necessary beyond covering up any opening that may appear while the burning is in progress.

In the case of trees having very large roots, it is advisable after they have burned through and fallen away to close up the end of the burning root with a few sods. By doing so, very little root running will afterwards be found necessary.

It may be mentioned that the stoving out of a stump can be accomplished in much quicker time than that entailed in explaining the process.

IMPROVEMENTS AT GATTON COLLEGE.

[By ARTHUR MORRY, Surveyor, Department of Agriculture and Stock.

There has recently been completed at the above institution a series of improvements, which it is expected will add materially to the economical and efficient working of the same.

Power had to be provided for driving the dairy plant, the chaff-cutting and milking machines, the silo elevators, the electric dynamo, the refrigerating plant, and the irrigation and water supply centrifugal and plunger pumps. This required the use of three boilers continuously, with two others in reserve, and an oil engine. These boilers and engines have now been put out of commission, and a new suction gas and electric

power plant installed, consisting of a 45-b.h.p. Kynock suction gas engine, with a 53-b.h.p. gas plant, and all accessories complete, connected with a 24-k.w. dynamo, generating current for a 25-b.h.p. motor at the pumping station, with about 1 mile of cable and a 12-b.h.p. motor at the new dairy, and a 12-b.h.p. portable motor used for chaffcutting, woodcutting, and other purposes. An accumulator battery for electric lighting, consisting of 62 premier accumulators in glass cells, with a capacity of 450-amp. hours, has also been provided, with a motor generator for charging same. The whole of this is connected with a marble charging board mounted with the necessary instruments and meters. The old dairy building has been converted into a very excellent power-house, providing ample space for all present requirements; while the former cheese store has made an excellent accumulator battery-room.

At the pumping station a new Mather and Platt high-lift centrifugal turbine pump, with a capacity of 70 gallons per minute, has been installed for supplying the institution. This is fixed on a concrete bed, and is connected with a specially constructed concrete sump, from which a 5-in. suction pipe operates; the pump runs at a speed of 1,390 revolutions per minute, and absorbs from 7 to 9 b.h.p. The 25-b.h.p. motor driving this is protected from the weather in a suitable weather-board house, with a solid block concrete foundation carried sufficiently high to avoid ordinary floods, but which, in case of a very high rise in the creek, can be detached from its bed, slung on a steel cable, and hoisted to the shed on the bank top. The irrigation pump, discharging 50,000 gallons per hour, is also operated by this same motor when running at a speed of 800 revolutions per minute.

A new dairy building was rendered necessary by the conversion of the old dairy into a power-house. This building, designed and erected by the Departmental Surveyor, provides accommodation for a complete dairy course. Separate butter and cheese manufacturing rooms; a combined testing and class room; cold stores for butter, cheese, and meat; ample veranda space; boiler-house for a 4-h.p. vertical boiler for steaming cans, &c.; condensing-house with coils; and a convenient machine-room are all provided. The latter room is fitted up with a 4-ton ammonia compressor, centrifugal pump for forcing water from the condenser well over the coils, and a 12-b.h.p. electric motor, which drives the whole without dust or smoke.

In the butter manufacturing room, a 100-lb. simplex combined churn and worker is installed, driven by electric power. The testing-room is well equipped; and cold water and steam are both laid on throughout the building.

A few things are still required to complete this useful addition to the College, and, when supplied, visitors will be able to see a modern school of dairy instruction, though on a small scale.

The accompanying photographs illustrate some portions of the improvements which have been carried out under the supervision of the Departmental Surveyor.

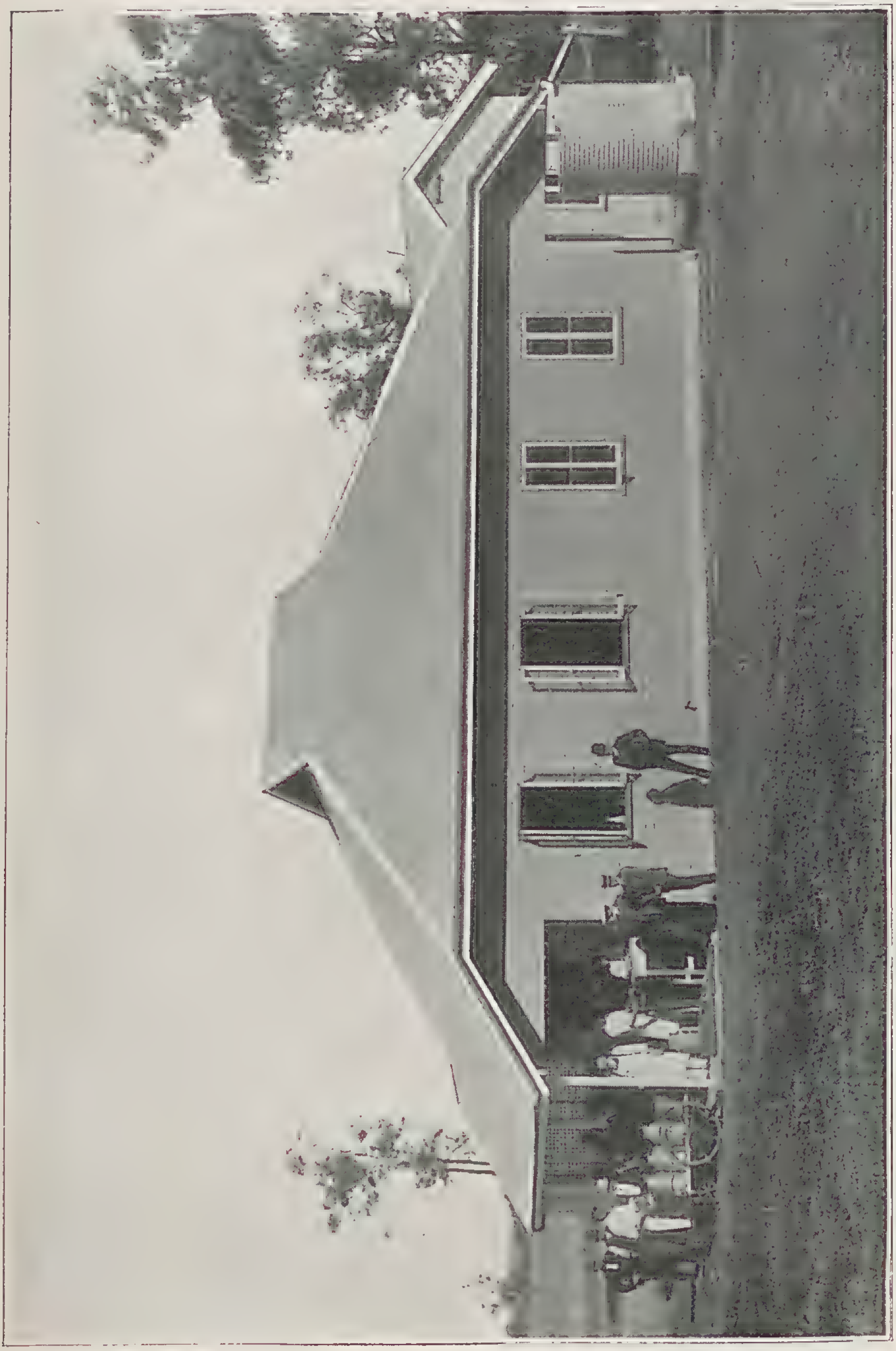


PLATE 14.—NEW DAIRY, GATTON COLLEGE.

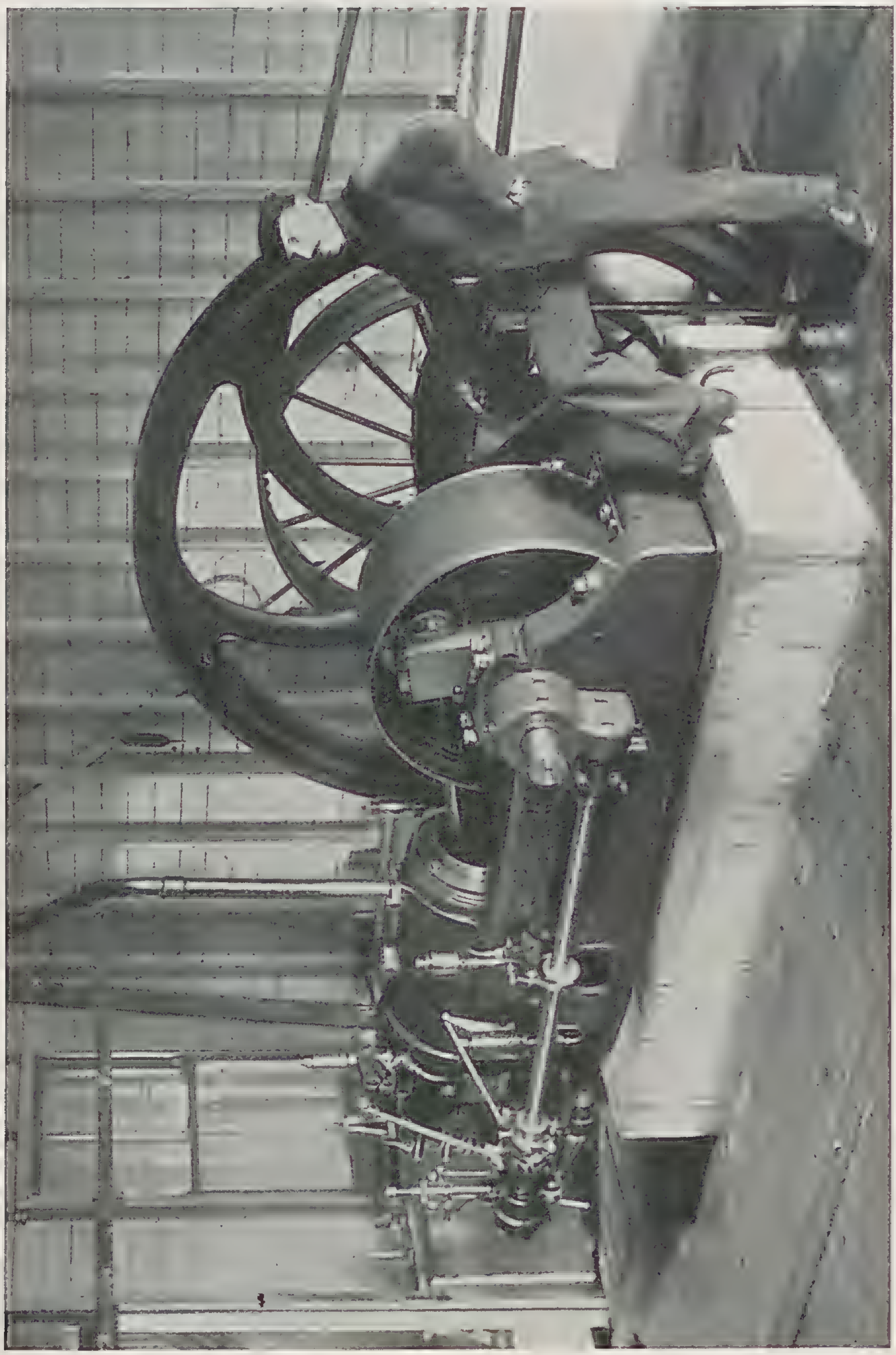
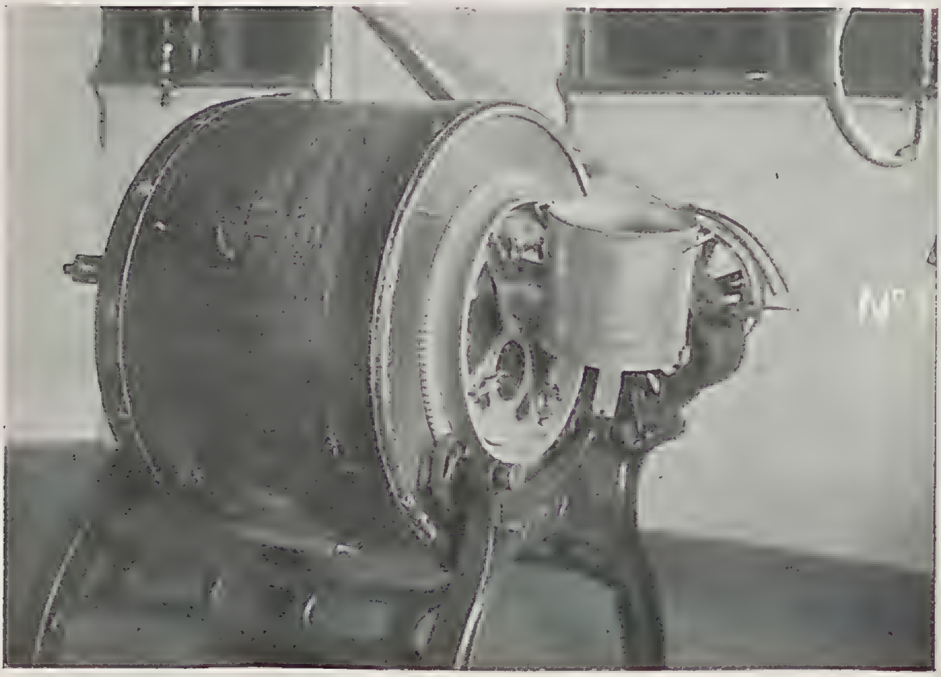


PLATE 15.—SUCTION GAS ENGINE IN POWER-HOUSE.

Plate 16.—Marble Switch Board and Motors in Power-house.



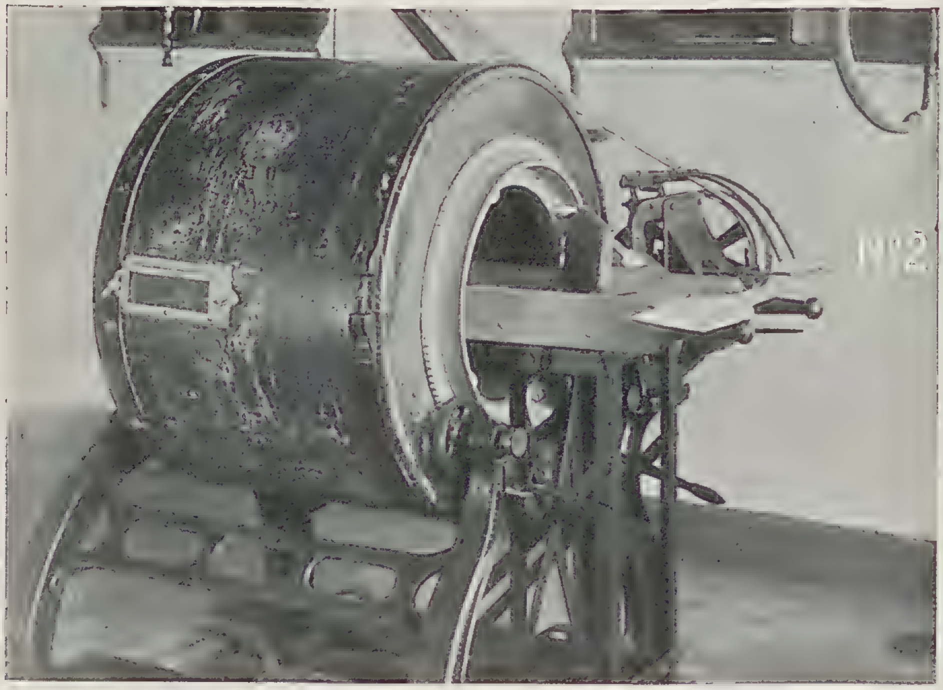


PLATE 17.—NO. 1, COMBINED CHURN AND WORKER WITH CREAM FILLER ATTACHED.
NO. 2, CHURN AND WORKER WITH BUTTER TROLLEY IN POSITION.

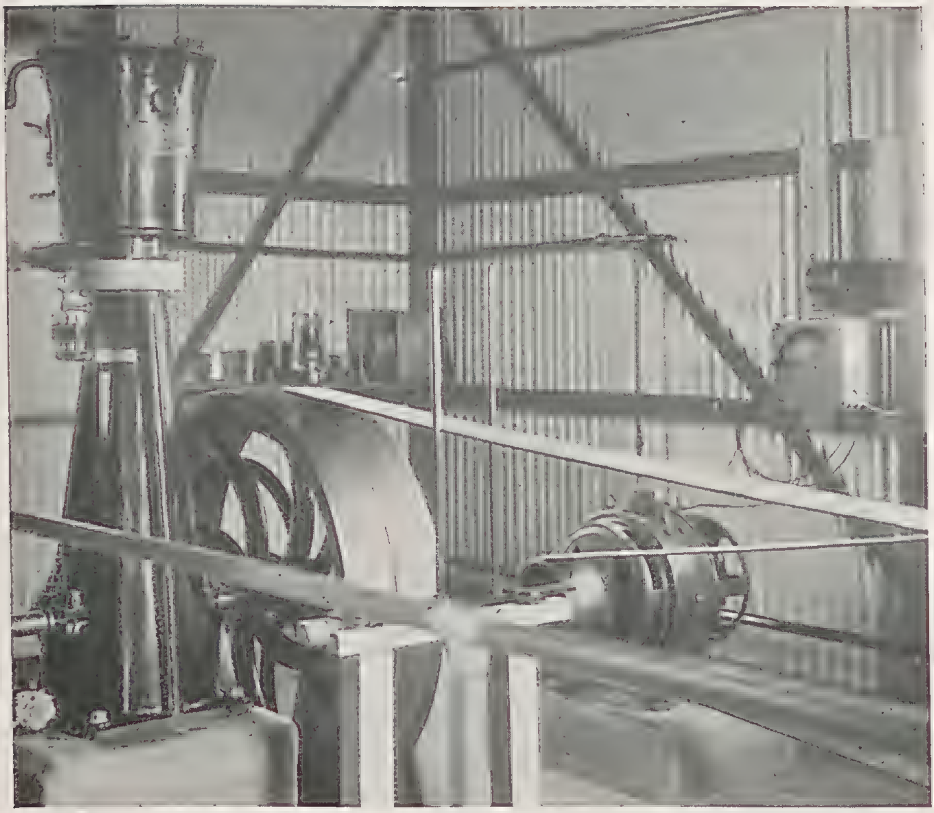


PLATE 18.—COMPRESSOR MOTOR AND RHEOSTAT IN MACHINE-ROOM OF DAIRY.

COMPLETE FERTILISERS FOR FARM AND ORCHARD.

[CONTINUED.]

BY J. C. BRÜNNICH, Chemist to the Department of Agriculture and Stock.

BEETS AND BEETROOTS.

Beets prefer a fairly rich sandy loam, but will do well on almost any soil, as long as it is not stiff and clayey. Well-rotted farmyard manure should be applied some time before sowing, and the following artificial fertiliser mixture used when thinning out or transplanting—

2 to 3 cwt. superphosphate
$\frac{3}{4}$ to 1 cwt. sulphate of potash
$1\frac{1}{2}$ to 2 cwt. nitrolim or sulphate of ammonia } per acre,

followed by a topdressing with 1 to 2 cwt. nitrate of lime about a month later. The sulphate of potash may be with advantage replaced by muriate of potash, or, when the sulphate is used, a dressing of common salt will be found beneficial.

Should the beet be grown without a previous application of farmyard manure, the quantity of artificial fertiliser must be increased, using—

4 to 6 cwt. superphosphate
$1\frac{1}{2}$ to 3 cwt. sulphate of potash
2 to 3 cwt. nitrolim } per acre

when planting, followed by a topdressing of 1 to 2 cwt. nitrate of lime.

In a garden use—

6 lb. of superphosphate,
2 lb. of sulphate of potash,
3 lb. of nitrolim or sulphate of ammonia

for every 43 square yards of ground, followed by a top dressing with 1 to 2 lb. of nitrate of lime.

CABBAGES.

Cabbages may be grown in almost any part of Queensland under certain conditions, but naturally do best in the colder districts. Rich, mellow soil, containing plenty of humus, and an abundant supply of water, are required. From 10 to 15 tons of well-rotted farmyard manure per acre, or from 2 to 3 cwt. to every 43 square yards, should be applied when the ground is being prepared. At the time of planting apply—

4 to 6 cwt. of superphosphate
$\frac{1}{2}$ to $1\frac{1}{2}$ cwt. of sulphate of potash
2 to 3 cwt. of nitrolim or sulphate of ammonia } per acre,

and about a month later a topdressing of 3 cwt. of nitrate of lime. A second topdressing with 1 cwt. of nitrate of lime, when cabbages begin to heart, is very beneficial.

The same amounts of fertilisers in pounds should be applied in a garden to every 43 square yards, or, as large cabbages should be planted about 3 feet between rows, to every row 43 yards long.

Should no or only a small amount of farmyard manure be available, the amounts of nitrogenous manure should be increased by at least one half.

Commercial mixed fertilisers, containing, besides water-soluble phosphoric acid, 3 to 4 per cent. of nitrogen, and about 2 per cent. of potash, may be used in quantities from 3 to 4 cwt. per acre at the time of planting, a second dressing of 2 to 3 cwt. about a month later, and a third dressing of 1 to 2 cwt. when hearts begin to form.

CAULIFLOWERS.

Cauliflowers require a very rich loam, and, like cabbages, a heavy dressing of farmyard manure.

When using from 10 to 15 tons of stable manure per acre, when the ground is being prepared, the following mixture of artificial fertilisers should be applied, per acre, when planting :—

4 to 6 cwt. of superphosphate ;
1 to 2 cwt. of sulphate of potash ;
2 to 3 cwt. of nitrate of lime ;

the latter to be applied in two dressings.

Without farmyard manure use—

$$\left.\begin{array}{l}\text{6 cwt. of superphosphate}\\ \text{2 cwt. of sulphate of potash}\\ \text{2 cwt. of nitrolim or sulphate of ammonia}\end{array}\right\}\text{ per acre}$$

when planting, and two or three topdressings of 1 cwt. of nitrate of lime each.

CARROTS.

Carrots do best on a rich sandy loam, deeply cultivated and well drained. Stable manure should never be applied immediately before this crop is grown, but rather the preceding year.

Apply per acre—

4 to 6 cwt. of superphosphate ;
1 to 2 cwt. of sulphate of potash ;
2 cwt. of nitrolim, or sulphate of ammonia ;

and two topdressings of 1 cwt. of nitrate of lime each.

CASSAVA.

This plant yields very heavy crops of roots under favourable conditions, and thrives best on light sandy loams, with a well-drained porous subsoil. Although such a heavy cropper, this plant does not require very large amounts of artificial fertilisers. Commercial mixed fertiliser containing from 6 to 10 per cent. of water-soluble phosphoric acid, 3 per cent. of nitrogen, and 6 to 8 per cent. of potash, may be applied at the rate of $2\frac{1}{2}$ to 4 cwt. per acre. The following mixture may also be used with advantage before planting :—

$$\left.\begin{array}{l}\text{1 to 2 cwt. of superphosphate}\\ \tfrac{1}{2}\text{ cwt. of sulphate of potash}\\ \text{1 cwt. of nitrolim}\end{array}\right\}\text{ per acre.}$$

CELERY.

This vegetable requires a deep, rich, vegetable mould in a moist situation. When preparing beds or trenches, lay in at the bottom about 4 in. of well-rotted stable manure, which is to be well forked in. A heavy dressing of an artificial fertiliser containing from 6 to 10 per cent. of soluble phosphoric acid, 6 to 8 per cent. of potash, and 4 to 6 per cent. of nitrogen, should also be applied, using about 6 cwt. per acre, previous to planting out, and two or three topdressings of 1 cwt. each.

The use of liquid manure and sprinkling with a little salt are also to be recommended.

Instead of the ready mixed fertiliser, the following mixture may be used with advantage :—

$$\left.\begin{array}{l}\text{3 cwt. superphosphate}\\ \text{1}\tfrac{1}{2}\text{ cwt. sulphate of potash}\\ \text{2 cwt. nitrolim, or sulphate of ammonia}\end{array}\right\}\text{ per acre}$$

at the time of planting, followed by two topdressings with a mixture of—

$$\left.\begin{array}{l}\text{1 cwt. superphosphate}\\ \tfrac{1}{2}\text{ cwt. sulphate of potash}\\ \text{1 cwt. nitrate of lime}\end{array}\right\}\text{ per acre.}$$

In this case muriate of potash may with advantage replace the sulphate of potash.

CHERRIES.

The successful growth of this fruit is confined to a few localities in this State, as it requires a well-defined cold winter and rather rich, deep, well-drained loam. In suitable localities the use of artificial fertilisers is particularly profitable for this crop, and in accordance with the size of the tree and expected crop the following quantities should be applied per tree :—

2 to 4 lb. of superphosphate ;
1 to 2 lb. of sulphate of potash ;
1 to 1½ lb. of nitrolim, or sulphate of ammonia ;

or,

1 lb. of superphosphate ;
2 to 4 lb. bonemeal ;
1 to 2 lb. sulphate of potash ;
1 to 2 lb. dried blood ;

or,

from 5 to 10 lb. of a mixed fertiliser containing from 6 to 12 per cent. soluble phosphoric acid, 3½ to 4 per cent. of nitrogen, and 5 to 6 per cent. of potash.

COCOANUT PALM.

The cultivation on commercial lines is confined to the Northern coastal districts and the islands off the coast. The palm thrives best in the loose, moist, sandy soils on or near the seashore. In nearly all tropical countries where this palm is grown to any extent, manuring with artificial fertilisers has been found very profitable.

Apply round each tree, a little distance from the butt, towards the end of the rainy season, in February or March, and again at the end of winter—

1 to 2 lb. of superphosphate;
1 to 2 lb. of sulphate of potash;
½ to 1½ lb. of dried blood;

or,

2 to 3 lb. meatworks manure;
1 to 2 lb. sulphate of potash.

Compost made of seaweeds and woodashes, to which some pulverised oil cake should be added, can be used with advantage.

COFFEE.

Young seedlings require a fairly rich, sandy soil, containing plenty of humus, and are generally fertilised with stable manure or compost. The use of about 1 lb. of nitrate of lime to every row 30 yards long increases the growth of the seedlings, so that they can be planted out much sooner. For the plantation select a rich, sandy loam, containing an abundance of humus, with a well-drained, gravelly subsoil. If clayey loams are used, they will have to be limed every four or five years. Before planting out, use a fertiliser mixture containing from 7 to 10 per cent. of soluble phosphoric acid, 4 to 6 per cent. of nitrogen, and 10 to 12 per cent. of potash, in quantities from 7 to 9 cwt. per acre; or the following fertilisers:—

3 to 4 cwt. superphosphate
1 to 1½ cwt. sulphate of potash } per acre.
1½ to 2 cwt. nitrolim

For the first four years the trees require little artificial manure, but will benefit by an application of ¾ lb. to 1 lb. per tree of the abovementioned fertiliser mixture. Trees from five to eight years old require 2 lb. per tree, and from eight years old or more 3 lb. per tree, of a mixture containing a little less nitrogen, viz.:—

10 per cent. of water-soluble phosphoric acid,
4 per cent. of nitrogen, and
8 per cent. of potash.

A similar application is effected by using—

1 lb. superphosphate,
½ lb. sulphate of potash,
½ lb. nitrolim

per tree, between the age of five to eight years, and

1½ lb. superphosphate,
¾ lb. sulphate of potash,
½ lb. nitrolim

per tree more than eight years old. The fertiliser must be thoroughly mixed with the soil around the trees, in a circle about equal to the spread of the branches. In order to get good results, it is absolutely necessary to keep up the humus contents of the soil by using plenty of compost or stable manure, or a mulch of a green manure crop grown between the rows of trees.

CORN (MAIZE).

Corn does best in a deep, sandy loam, rich in humus, and not containing too much clay. This crop makes a heavy demand on plant foods, particularly when grown for **ensilage** or **green fodder,** and farmyard manure used in combination with artificial fertiliser gives the best results. Apply in the drills, when planting, any of the following mixtures :—

2 to 4 cwt. of superphosphate
½ to 1½ cwt. of sulphate of potash } per acre ;
2 to 1 cwt. of sulphate of ammonia or nitrolim

or,

3 to 5 cwt. of bonemeal
½ to 1½ cwt. of sulphate of potash } per acre ;
1 to 1½ cwt. of dried blood, or nitrate of lime

or,

from 3 to 5 cwt. of a fertiliser mixture containing 7 to 10 per cent. phosphoric acid (chiefly water-soluble), from 3 to 4 per cent. of nitrogen, and from 6 to 8 per cent. of potash. Part of the manure, 2 to 3 cwt., may be applied when sowing, and 1 cwt. or more between the drills before hilling.

When maize is grown for **grain,** the amounts of artificial fertilisers may be varied, and in a rich soil the manure supplying nitrogen left out altogether, using per acre—

3 cwt. of superphosphate ;
1 cwt. of sulphate of potash.

In a poor soil about ½ cwt. of dried blood or of nitrolim may be added.

COTTON.

Several districts in Queensland are eminently suitable for the culture of cotton, as this plant is well adapted to stand droughty conditions. Cotton does best on deep, sandy loams, or even on fairly heavy clay, if it contains plenty of lime and a fair amount of humus. When grown in rotation with other crops, more particularly leguminous crops, only light dressings with artificial fertilisers are required.

Apply per acre—

2 cwt. of superphosphate or bonemeal ;
½ cwt. of sulphate of potash ;
1 to 1½ cwt. of dried blood or nitrate of lime ;

or,

2 cwt. Thomas phosphate ;
½ cwt. sulphate of potash ;
½ cwt. ammonium sulphate ;

or,

3 to 4 cwt. of meatworks manure (with blood) ;
½ cwt. sulphate of potash ;

or,

from 3 to 6 cwt. of a mixed fertiliser containing 8 to 10 per cent. phosphoric acid, 2½ to 3 per cent. of nitrogen, and 4 per cent. of potash.

In localities where the crop is susceptible to blight the following mixture should be tried :—

2 cwt. Thomas phosphate
1 to $1\frac{1}{2}$ cwt. of kainit
1 to $1\frac{1}{2}$ cwt. of nitrate of lime or dried blood
} per acre.

COWPEAS.

This crop is chiefly grown as a green manure crop, but makes a very nutritious hay and chaff, and the pods may be eaten as a vegetable. This leguminous plant prefers a fairly rich sandy loam, which must contain a liberal amount of lime.

Apply per acre from 5 to 6 cwt. of a mixed fertiliser containing from 7 to 9 per cent. of soluble phosphoric acid, and 9 per cent. of potash, or use one of the following fertilisers :—

2 cwt. superphosphate
3 cwt. kainit
} per acre ;

or,

2 cwt. superphosphate
$\frac{3}{4}$ to 1 cwt. muriate of potash
} per acre ;

or,

3 cwt. Thomas phosphate
$\frac{3}{4}$ to 1 cwt. muriate of potash or sulphate of potash
} per acre ;

One half of the manure can be broadcasted and the other half applied in the drills when planting.

Although as a rule no nitrogen needs to be applied, in many instances, when grown as a green manure on poor, exhausted soils, the addition of a little nitrate of lime, or of nitrolim, in the drills, at the rate of $\frac{1}{2}$ cwt. per acre, may be very beneficial.

CUCUMBERS.

This vegetable may be grown on almost any soil, as long as it is fairly light and loamy, and plenty of manure is added. The pits or hills should be prepared by mixing a large amount of well-rotted stable manure, sheep or fowl dung, ashes, and bonedust with the soil.

Apply in addition the following artificial fertilisers :—

3 to 4 cwt. of superphosphate
$1\frac{1}{2}$ to 2 cwt. of sulphate of potash
$1\frac{1}{2}$ cwt. of sulphate of ammonia or nitrolim
} per acre ;

or the same amounts in pounds to every 43 square yards.

An excessive amount of nitrogenous manure, more particularly in the form of quick-acting nitrates, may cause an excessive growth of vines and poor quality of cucumbers.

CUSTARD APPLES (Cherimoyer).

This tree is easily grown on most parts of coastal Queensland, or any fair class of soil. Apply, in accordance with the age of the tree :—

1 to 3 lb. superphosphate
2 to 6 lb. meatworks manure (with blood)
1 to 2 lb. sulphate of potash
} per tree ;

EGG PLANTS or EGG FRUITS.

This vegetable is as hardy and easy to grow as the closely allied tomato, and requires a fairly rich sandy loam.

Apply per acre from 8 to 12 cwt. of a fertiliser containing 5 to 7 per cent. soluble phosphoric acid, 4 per cent. nitrogen, and 8 to 9 per cent of potash, or use the following mixture :—

4 to 6 cwt. of superphosphate
$1\frac{1}{2}$ to 2 cwt. of sulphate of potash
$1\frac{1}{2}$ to 2 cwt. of nitrolim or sulphate of ammonia
} per acre ;

or the same quantities in pounds s to every 43 square yard.

ESCHALOTS (see Leeks).

FIGS.

Figs may be grown in almost any soil, but a fairly rich sandy loam is preferable. Figtrees are very greedy feeders, and the roots spread for long distances in all directions, to get plant foods or moisture.

Apply, per tree, in accordance with its size :—

2 to 4 lb. bonemeal
1 to 2 lb. superphosphate
1 to 2 lb. sulphate of potash ;

or,

2 to 4 lb. meatworks manure
1 to 2 lb. superphosphate
3 to 6 lb. kainit.

FLOWER GARDEN.

For flowers—more particularly for carnations, crysanthemums, &c.—prepare a manuring mixture as follows :—

$\frac{1}{2}$ cwt. superphosphate
$\frac{1}{4}$ cwt. bonedust
$\frac{1}{4}$ cwt. nitrolim (or dried blood)
14 lb. sulphate of potash,

and apply at the rate of 8 to 10 lb. to every 43 aquare yards, or from 3 to 4 oz. to every square yard; or from 1 to $1\frac{1}{2}$ oz. of fertiliser to every 2 lb. of potting soil.

GRAPES.

Grapes may be successfully grown over a great part of Queensland, extending from the coast to the interior. Any soil, from a light loam to a clayey soil, is suitable, as long as it contains plenty of sand and gravel, and is well-drained.

Improved methods of cultivation and the use of artificial fertilisers increases yield and quality of the fruit considerably. Excellent results have been obtained in South Australia with a yearly application of :—

1 cwt. superphosphate
$\frac{1}{4}$ cwt. sulphate of potash
$\frac{1}{4}$ cwt. sulphate of ammonia
} per acre ;

or applying about 3 oz. of the mixture to each vine.

In many localities a heavier dressing of artificial fertilisers may be profitable, using, for instance :—

2 cwt. superphosphate
1 cwt. sulphate of potash } per acre;
$\frac{1}{2}$ cwt. sulphate of ammonia or nitrolim

or about $\frac{1}{2}$ lb. of the mixture to each vine.

Green manuring, in addition to the yearly application of artificial fertilisers, is strongly recommended, and the crop should be ploughed under to a depth of at least 9 inches.

Liming the soil every five or six years, with about 1 ton of air-slaked lime or gypsum per acre, may also be very profitable.

HOPS.

Hops have been grown in a few localities in Queensland, but the product obtained was not of a very high quality. Our climate is hardly cold enough, and the rainfall barely sufficient. Hops require a very rich sandy loam and heavy applications of artificial fertilisers, up to 10 cwt. per acre, so that a profitable cultivation in Queensland is hardly probable.

LEEKS and ESCHALOTS.

These vegetables require a deep, rich, sandy loam, a liberal manuring with stable manure, ashes, bonedust, &c., when preparing the bed, and a copious supply of liquid manure during their growth.

A complete fertiliser is made up as follows :—

4 to 6 cwt. superphosphate
1 to $1\frac{1}{2}$ cwt. sulphate of potash } per acre;
2 to 3 cwt. sulphate of ammonia or nitrolim

or the same quantities in pounds to every 43 square yards.

LEMONS (Limes and Citrons).

Citrus fruits may be grown from one end of the State to the other, provided that the soil is suitable, and for this reason the careful selection of the soil is of the greatest importance. The soil need not be extremely rich, but must be in good mechanical condition, friable and perfectly drained, with a free, porous subsoil. The soil most suitable is a deep, sandy loam, of reddish, brownish, or chocolate colour, and fairly rich in humus and lime. Clayey subsoils must be avoided.

Lemons grow and bear well in the coastal districts, but the fruit is not of a high quality, and better results are obtained inland. Limes and Citrons, however, do particularly well all along our eastern seaboard.

As soon as the trees come into bearing the use of artificial fertiliser will become profitable, both in regard to quantity and quality of the fruit. It is always best if the use of artificial fertiliser is combined with application of either farmyard manure, compost, or green manure.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RECORD OF COWS FOR MONTH OF JUNE, 1912.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Lerida ...	Ayrshire	4 Mar., 1912	884	4·2	38·70	
Lady Margaret	,, ...	4 Mar. ,,	695	4·0	31·06	
Nellie II. ...	Shorthorn... ...	1 Feb. ,,	615	4·2	28·93	
Lavinia's Pride	Ayrshire	23 Feb. ,,	599	4·1	27·47	
Miss Hayden	Shorthorn... ...	21 Mar. ,,	579	4·0	25·87	
Davidina ...	Ayrshire	29 Dec., 1911	558	4·1	25·54	
Burton's Lady	Shorthorn... ..	1 June, 1912	569	3·9	24·76	
Redrose ...	,, ...	23 Mar. ,,	475	4·5	24·07	
Laura ...	Ayrshire	6 Mar. ,,	496	4·2	23·33	
Miss Jean ...	,, ...	10 April ,,	503	4·1	23·07	
Lady Morton	Shorthorn... ...	29 Feb. ,,	480	3·9	20·89	
Lark ...	Ayrshire	29 Nov., 1911	444	4·2	20·88	
Flora . .	Jersey	10 Feb., 1912	418	4·4	20·64	
Butter ...	Shorthorn... ...	6 Nov., 1911	426	4·3	20·53	
Mist ...	Holstein	2 Oct. ,,	467	3·9	20·32	
Glen ...	Shorthorn... ...	30 Sept. ,,	350	5·1	20·17	
Dilly ...	,, ...	9 Feb., 1912	448	4·0	20·01	

RESULT OF MILK AND BUTTER COMPETITION.

ROCKHAMPTON AGRICULTURAL SOCIETY'S SHOW, JUNE, 1912.

We have received from the secretary of the Rockhampton Agricultural Society the following account of the Dairy Competition held in connection with the June show of the Rockhampton Agricultural Society. We regret that it was received too late for earlier publication:—

PERFORMANCES OF COWS.

—	Whiteback.	Fanny.	Jenny.	Posy.	Yellow Girl.	Mavis.	Florrie.	Stumpy.
Weight of morning milk (lb)	18·5	22·5	18·5	14·5	18·0	17·0	16·0	14·5
Weight of evening milk (lb)	17·5	20·0	14·0	12·5	12·0	10·0	16·5	12·0
Total weight of milk (lb) ..	36·0	42·5	32·5	27·0	30·0	27·0	32·5	26·5
Percentage of butter fat in the morning milk ..	4·4	3·0	3·2	5·0	4·4	3·8	3·2	3·8
Percentage of butter fat in the evening milk ..	4·0	3·4	4·0	4·2	4·6	4·4	3·6	3·6
Commercial butter from morning milk (lb) ..	0·90	0·72	0·74	0·80	0·88	0·71	0·56	3·60
Commercial butter from evening milk (lb) ..	0·77	0·75	0·61	0·58	0·61	0·49	0·66	0·48
Total commercial butter (lb)	1·67	1·47	1·35	1·38	1·49	1·20	1·22	1·08

PERFORMANCES OF COWS—*continued.*

—	Whiteback.	Fanny.	Jenny.	Posy.	Yellow Girl.	Mavis.	Florrie.	Stumpy.
POINTS AWARDED.								
Weight of commercial butter (lb)	33·4	29·5	27·0	27·7	29·8	24·0	24·4	21·6
Weight of milk (lb) ..	36·0	42·5	32·5	27·0	30·0	27·0	32·5	26·5
Points for time in milk ..	3·6	0	2·7	6·7	0	6·1	0	5·8
Points deducted for less than three per cent. of butter fat	0	0	0	0	0	0	0	0
Total	73·0	72·0	62·2	61·4	59·8	57·1	56·9	53·0

MILK AND BUTTER COMPETITION.

A milk and butter competition was again held in connection with the show. There were eight competitors, as compared with six last year. The prizes were: £10 10s., £5 5s., and £2 2s. The competition, as formerly, was carried out on the farms, where the cows were milked in the bails used every morning and evening, and by their ordinary attendants. No cow or heifer was allowed to compete unless she had calved at least seven days before the 1st May, 1912. A representative of the society attended the day before the milkings to see the cows milked dry and again at the test milkings. The milk obtained at each milking was weighed, and samples were taken for the purpose of ascertaining the percentage of butter fat. The regulations provided that the prizes were to be awarded to the cows that revealed the greatest merit with respect to the weight of milk, the quantity of butter fat, and the ratio of milk to the pound of commercial butter, a point being given for every ten days in milk since calving, deducting the first forty days, but with a maximum of fourteen points; a point for every pound of milk produced at two milkings; twenty points for every pound of marketable butter indicated according to the Babcock test, with a deduction of ten points each time the fat was below 3 per cent. It was also provided that, in the case of cows obtaining the same number of points, the advantage should be given to the cow that had been longest in milk. It was further provided that no prize should be given to a cow under five years of age that failed to obtain forty points, or to cows five years and over that failed to obtain fifty points. In arriving at the quantity of butter the method was that adopted by the Queensland Government. The cows were milked between the 1st and the 15th of May, inclusive, in the presence of Mr. H. T. Deighton, Government Inspector of Dairies in the Rockhampton district, who also conducted the tests for butter fat.

The results were sealed by Mr. Deighton as soon as they were completed, and were made available yesterday by the secretary (Mr. H. Hill). The cows were placed in the following order:—

Messrs. Archer Brothers' Whiteback, 73 points	1
Mrs. Ruth Watson's Fanny, 72 points	2
Messrs. Archer Brothers' Jenny, 62·2 points	3
Messrs. S. G. Hoare's Posy, 61·4 points	4
Messrs. Archer Brothers' Yellow Girl, 59·8 points	5
Mr. P. C. Marwedel's Mavis, 57·1 points	6
Mr. W. E. Higson's Florrie, 56·9 points	7
Mr. S. G. Hoare's Stumpy, 53·9 points	8

DAIRY COW COMPETITION.

In conjunction with the milk and butter competition, there was a competition for cows giving the greatest weight of milk in two milkings, the milkings in the milk and butter competition to be also the milkings in the dairy cow competition. The prizes were £2 2s. and £1 1s. There were nine competitors as against six last year. The following were the results:—

Miss Ruth Watson's Fanny, with 22·5 lb of milk in the morning and 20 lb in the evening, or a total of 42·5 lb	1
Messrs. Archer Brothers' Stella, with 22·5 lb of milk in the morning and 17·5 lb in the evening, or a total of 40 lb	2
Messrs. Archer Brothers' Whiteback, with 18·5 lb of milk in the morning and 17·5 lb in the evening, or a total of 36 lb ..	3
Messrs. Archer Brothers' Jenny, with 18·5 lb of milk in the morning and 14 lb in the evening, or a total of 32·5 lb	4
Mr. W. E. Higson's Florrie, with 16 lb of milk in the morning and 16 in the evening, or a total of 32·5 lb	4
Messrs. Archer Brothers' Yellow Girl, with 18 lb of milk in the morning and 12 lb in the evening, or a total of 30 lb	5
Mr. P. C. Marwedel's Mavis, with 17 lb of milk in the morning and 10 lb in the evening, or a total of 27 lb	6
Mr. S. G. Hoare's Posy, with 14·5 lb of milk in the morning and 12·5 lb in the evening, or a total of 27 lb	7
Mr. S. G. Hoare's Stumpy, with 14·5 lb of milk in the morning and 12 lb in the evening, or a total of 26·5 lb	8

MOSQUITOES BREEDING IN SALT WATER.

The "Bulletin Agricole," Mauritius (April, 1912), states that Mons. Magen, Inspector of Agriculture in Cambodia, with Dr. Pannetier have found on the sea-shore, in a rocky hole full of salt water, a number of larvæ of the Anophele mosquito. This, says the Bulletin, is an interesting fact, since it proves that this redoubtable parasite can exist in salt water.

[When in New Guinea lately, we heard a similar statement as to Anophele mosquito larvæ being found in the salt water holes near the Baubagwina River, at Cloudy Bay, but, of course, no one believed it, and there was no scientific member of our party to investigate the truth or otherwise of the statement.—Ed. "Q.A.J."]

State Farms.

SOY BEAN TESTS AT ROMA STATE FARM.

From time to time articles have appeared illustrating the value of this crop, the great demand which exists for the seed, and the yields obtained in the various countries where it is extensively grown. Such will no doubt result in inquiries being received from farmers in the future for seed of the most suitable variety. In order to be in a position to be able to state which of the most common varieties was the best suited for this part of the State, the following kinds were tested last season, viz.:—Lange, Yellow, Black, and Yellow.

The seed was sown in rather poor sandy soil, on the 11th November, and the majority of those that germinated were through by the 16th.

The germination of the black was equal to about 80 per cent.; of the other two about 10 per cent. Whether the low germination was due to the age of the seed or the percentage of moisture in the soil not being sufficient was not determined; but most likely the former, as the black variety was received from Biggenden, and had a fresh appearance.

Of the resulting plants, only those from the black seed reached the seeding stage, the others succumbing during a dry spell. The plants of this variety only grew to about 15 in. high, producing very little foliage, did not branch, flowered early, producing pods as many as could be accommodated on the stalk, which, owing to the dry weather, were not any length, nor were they well filled; and when the plants dried off the pulse was found to be only half developed, notwithstanding the period which had elapsed since blossoming time.

The results, so far as the value of this crop is concerned, cannot be taken as final, for the following reasons:—They require a rich soil to grow in, more humid conditions, and sowing earlier in the season. Then again, there may be varieties amongst the dozens not tested here, at least, which may have characteristics which render them more suitable than those experimented with.

There was no comparison between the varieties grown and the cowpeas sown at the same time alongside in any way, as the latter germinated well, grew feet to inches of the other, produced a good crop of well-grown pulse, and the roots were covered with nodules, which were totally absent in the Soy beans, which had very poor root system, and one which appears more adapted for a climate where occasional showers are likely to be experienced than one where the periodical dry spells necessitate the plants obtaining their moisture from below.

Two features possessed by the Soy bean which, unhappily, are not found in the cowpea, is the ease of harvesting and the apparent even ripening of the pods.

It is intended this coming season to endeavour to secure seed of varieties more suited to the district, and sow them on a better class of soil than was devoted to the test last season.

Until further evidence is forthcoming, the growing of these beans in place of cowpeas for fodder, pulse, or as soil renovators, in this part of the State, at least, is not to be thought of; still, a few might be sown adjacent to home for trial purposes, and the beans used as a vegetable.

COWPEA TESTS AT WARREN STATE FARM.

By T. JONES, Manager State Farm, Warren.

Cowpeas have always proved to be our best fodder friend in dry weather, and to determine which variety is the most suitable for our locality, the following varieties were planted:—

No. 1. *Black.*—This variety has been grown here for three years, and is a good general purpose crop. It is rather difficult to harvest, owing to its creeping tendency, but is always a good yielder. The colour of the seed is black.

No. 2. *Whip-poor-Will.*—This is a more vigorous grower than the black, but their habits are similar. Its creeping nature would make it difficult to harvest. I find this variety always satisfactory, and would recommend it as a bulky cropper in this locality. Colour of seed, mottled brown.

No. 3. *Clay.*—This variety resembles the black, but is not quite as vigorous a grower. Colour of seed, clay.

No. 4. *Poonah.*—This is a fine upright variety; stem and leaf fine. The most suitable of any of the varieties on the farm for haymaking. The pods are very thin, the seeds small, and the crop as a whole is of a different type to the other varieties. It could be cut with the mower, and handled with comparative ease. Colour of seed, clay.

No. 5. *Chinese Mottled.*—A crop of the same habits as Whip-poor-Will, with the exception of its being a little finer, and more upright. The colour of the seed is mottled brown, dark.

No. 6. *Red Ripper.*—A low crop of creeping habits, with very thick, coarse pods. It is a slow grower, and unsuitable for haymaking. Not worthy of another trial here.

No. 7. *Southdown.*—A coarse variety, and a heavy seed-bearer. It has a small percentage of leaf to stem, and is unsuitable for haymaking. Not worthy of another trial.

No. 8. *Brown Eye.*—This bears the largest pods of any of our varieties, but the number of pods is small. It is a creeper, with very coarse stems, and unsitable for hay. Not worthy of another trial.

No. 9. *Red.*—A medium variety, of similar habits to the black; a good all-round variety.

No. 10. *Iron.*—A most vigorous grower. The pods are long and thin. The seed is small, and of a cream colour. I am of the opinion that this would be a suitable variety to grow with maize for silage.

No. 11. *White.*—A dwarfy variety. The pods are thin and badly filled. The poorest of all the varieties here.

No. 12. *Groit.*—This is the best all-round variety up to date. The pods are medium in length and well filled. The leaf is wide and healthy, and the crop is a good height. It would make a bulky crop of first-class hay, and would not be very difficult to handle. Colour of seed, mottled grey.

Farmers will probably pay more attention to this cowpea when the varieties suitable for hay become better known.

Plate 19.—Exhibit of the State Farm, Warren, at the Rockhampton Agricultural Society's Show, June, 1912.

RINGING (CINCTURING) PEACH TREES.

By R. SOUTTER, Manager, Bungeworgorai State Farm, Roma.

In the May issue of the *Journal,* a short paragraph appeared referring to some experiments carried out in ringing peach trees at an experiment station at Bologna, Italy. As something in the same direction was entered upon at the Roma State Farm last season, a few notes on the results, as far as has been gone, may prove interesting.

For the uninitiated a brief outline of the process will be given.

Cincturing consists in the removing of a ring of bark from the stem or a branch or branches of a tree, for the purpose of obtaining more fruit, better fruit, and earlier fruit. It is also used by the horticulturist for other purposes.

The incisions for removing the bark in the case of trees are generally made with an ordinary strong pocket knife, as deep as the alburnum, or woody portion of the branch, and great care must be exercised so as not to injure this in any way.

This operation does not interfere with the upward journey of the sap, if carried out carefully, as it is the sap wood, or alburnum, which takes the principal part in its conveyance, but it does upon its return by the liber, or inner bark, after having become elaborated, with the consequence that it accumulates above the incision, resulting in a thickening of the stem, the production of more flower buds, which set better, and ultimately better and earlier maturing fruit are obtained.

The operation cannot be practised every year, as it enfeebles the plants or trees to a more or less extent.

For the experiment here three trees, set out five years previously, which, though they had made extra vigorous growth, had produced very little fruit, and were, therefore, very suitable subjects, were selected, and treated as follows:—

No. 1.—Had all its branches cinctured.

No. 2.—Control.

No. 3.—Had one branch cinctured.

A dressing of the fertiliser recommended by Mr. Brünnich for deciduous trees was applied to each, and resulted in the untreated tree producing more fruit than it had done previously. The bark was removed from the branches in a spiral fashion, so that, although they had been circumscribed, a total severance of the top from the bottom portion did not take place. The operation was carried out when the buds commenced to swell.

On tree No. 1, cuts from half an inch to an inch in width were made. There was no marked difference in the yield of fruit resulting from this, but at the close of the season it was noticeable that the smaller incision had completely healed over, thereby affording no inducement for borers, &c., to get a footing, whereas the wider incisions, though nearly covered over, did so. It may be stated here that all cuts were tarred over as a precautionary measure against outside injury. The tree bore a good crop, considering the dry season and its previous performances, of good, even quality fruit, the earliest of which ripened before any on the untreated tree by from ten to fourteen days. Though no test was

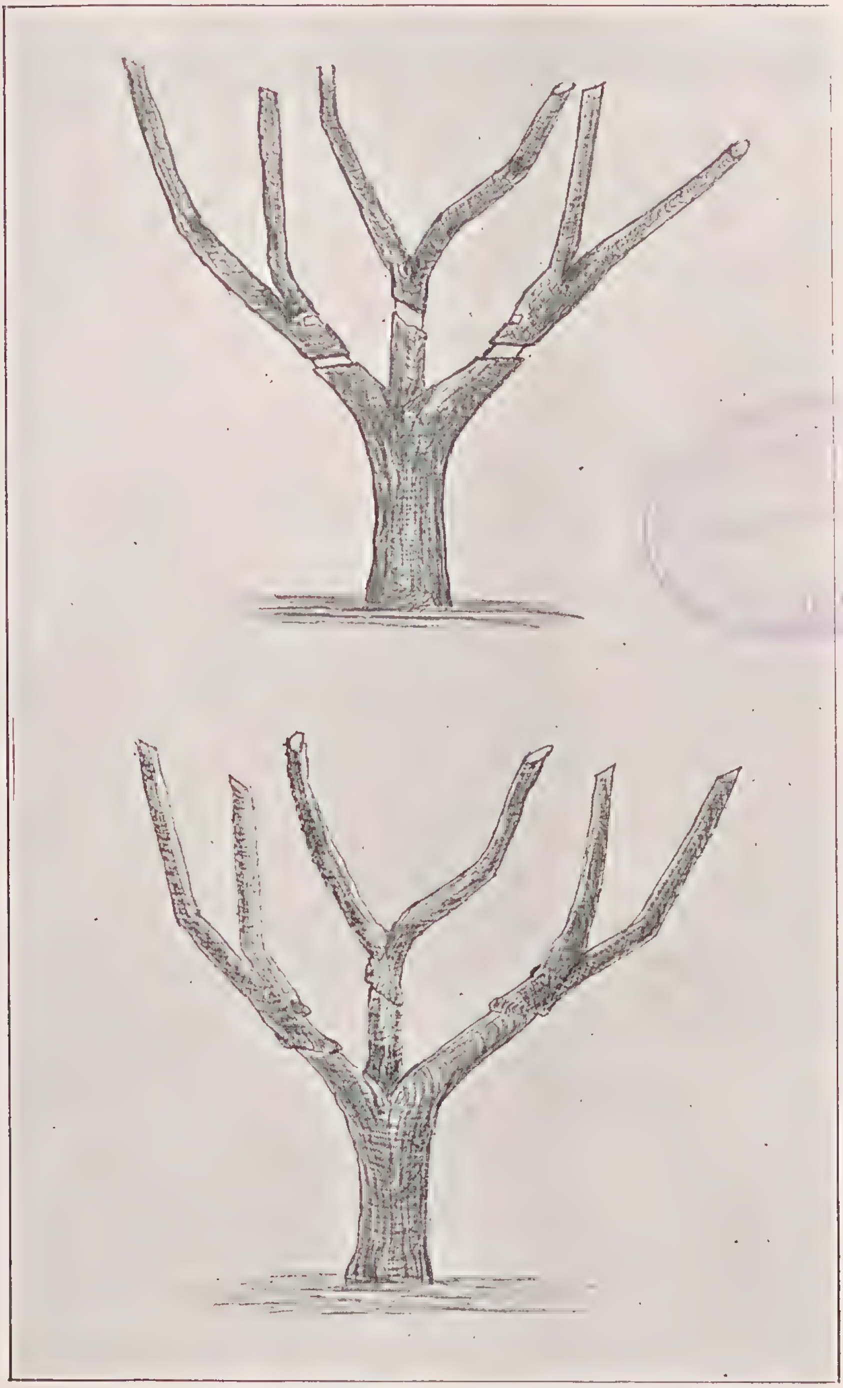


Plate 20.—Ringing (Cincturing) Peach Trees.

made as to whether the fruit would hang after ripening, practically no windfalls were gathered; a very few dropped off at stoning time.

From appearances it is believed that the effects of the treatment will be more marked next season, more especially on the wider-cinctured branches, as very few sterile buds are noticeable throughout the tree, they being much plumper and better grown than usual. This may be due to a certain extent to the manure already mentioned, but not wholly so, as the remarks on No. 2 tree will show.

No. 2.—Though so far as appearance went, there was no great difference, if any, in the amount of blossom on this tree and No. 1, fewer set for fruit, and again, at stoning time many more were detached, so that at maturity only about half as many were found. Individual fruits of as good quality as on No. 1 were met with, but as a whole, they were uneven in size and of poorer appearance and flavour.

This tree contains many more blind buds, and from present appearances will not produce one-quarter the blossom that No. 1 tree will; but it is slightly early yet to make comparisons in this direction.

No. 3.—The branch operated on on this tree bore the bulk of the fruit, all of which was of even size and quality. It produced also the first ripe fruit on the tree. The fruit on the other portion was similar to that found on No. 2.

No differences in quality of growth made were noticeable in any instance.

INDIGENOUS GRASSES.

By R. JARROTT, Manager State Farm, Gindie.

The trying time those engaged in the pastoral industry are experiencing will give them an opportunity of noting the value of some of our indigenous grasses.

No doubt, under anything like fair weather conditions, the Blue grass (*Andropogon sericeus*) stands first. The fact that in a time like the present it is the first to be eaten out proves it a favourite with all kinds of stock. On country that is somewhat stony, where the soil is light in comparison with the black soil flats, it responds to a light fall of rain; but on the heavy black soil flats it requires a good fall to start it into growth after a prolonged spell of dry weather.

There is a little of two varieties of Mitchell grass in this neighbourhood, *Elymoides* and *Curvifolia,* both of which are splendid drought-resisters, and respond quickly to rain, putting out new growth from eyes on the old stalks. *Pollinia fulva,* or Red Top, is another excellent grass, especially in a dry season. It has been our mainstay. This year, in one of the paddocks, we have just finished using the bush hay that has been put up from time to time. One of the stacks, which was built about eight years ago, contained a large proportion of this variety, and it was in splendid condition. But, as it is inclined to be a little coarse, in a wet season it is necessary, if desired for hay, to cut it early, just when a portion of it is coming into bloom.

The Orchard.

THE BANANA IN QUEENSLAND.

By A. J. BOYD.

[CONTINUED FROM JULY NUMBER.]

VARIETIES OF BANANAS.

There are practically only three varieties of the Banana, so far, grown in Queensland on a commercial scale; but last year (1910) the Department of Agriculture and Stock imported several thousands of the Gros Michel variety from Jamaica. These were distributed to banana-growers in several districts; and during 1911, or early in 1912, there will be a certain quantity of this fruit on the market. Further large importations have been made by the Department, and it will not be long before the Queensland Gros Michel will enter into competition with the Fijian fruit of this name, which is so much esteemed and which brings such high prices in the Sydney and Melbourne markets. It remains to be seen, however, whether, under the present labour conditions in this State, our fruit will be able to compete with the black-labour-grown article from Fiji. A heavier duty on imported Bananas would give a great stimulus to growers in this State. Without this protection, our Banana industry will probably not again reach the importance attached to it prior to the year 1909.

The varieties of bananas cultivated in Queensland are:—

The Cavendish (*Musa Cavendishii,* syn. *Musa chinensis*).—This plant is of low stature, and is, therefore, eminently adapted for districts subject to high winds and cyclones. The fruit, when ripe, is yellow, and the flesh whitish. The bunch is very large, and the fruit of excellent flavour. This is the principal variety grown in the North, but ere long it will be superseded by the Gros Michel, of which several thousands are now growing and producing suckers, besides which further consignments have been received from Jamaica.

Lady's Finger, or small Fig, has much the appearance as to colour of fruit and flesh as the Cavendish; it is an excellent dessert fruit.

Red or Chocolate-coloured Banana (*Musa sapientum,* var. *rubra*).—This is sometimes called the "Red Spanish." The plant grows to a considerable height, rising to 25 to 30 ft. The general appearance of the plant, midrib of the leaf, and of the fruit is reddish or rather chocolate-coloured. The fruit has a good flavour, but does not find much favour with the trade, and is consequently only grown to a limited extent.

The Sugar Banana is largely grown in the Southern portion of this State. There appear to be two varieties of this fruit. Although the bunches of both are very large, yet the fruit of one is very small, whilst the other is about half the size of the Cavendish. The skin is yellow and very thin, the flesh sweet, but somewhat astringent if the fruit is cut before ripening. I think this is the fruit known in China as the "Apple Banana."

The Plantain (Musa Paradisiaca).—In some English colonies where the Banana is largely cultivated, the term "Plantain" is the common designation, while in others that of "Banana" is commonly used. Perhaps the best distinction is the application of the term "Plantain" to those varieties which are only used for cooking, or are otherwise prepared; and that of "Banana" to those which make a pleasant fruit when ripe and eaten raw. The word "Plantain" has, however, no specific meaning —in fact, the literature of the Banana may be described as chaotic. There are more than 100 varieties, but the distinction between variety and species has never been accurately determined in the genus *Musa*. The fruit of the Plantain is prominently angled.

The Gros Michel.—This is probably identical with the Martinique or Jamaica plant. The difficulty about the nomenclature of various Bananas is that they receive different names in different countries. The Martinique variety, with large yellow fruit, is known throughout the United States of America as the Jamaica Banana; in Dominica it is called "Figue de rose"; and in Trinidad, Jamaica, and Fiji, the Gros Michel. The plants are large, the bunches heavy, the fruit of fine appearance; but the flavour, in the opinion of many, is not so fine as that of the Cavendish. Still it is the favourite commercial fruit in the Southern State, and is imported in large quantities from Fiji, where it is cheaply produced by black labour, and, consequently, the importers prefer the Gros Michel to the Queensland Cavendish.

Indigenous Bananas.—In the dense scrubs of North Queensland the Banana is indigenous, and may be seen growing everywhere in great luxuriance, but the fruit borne by these wild varieties is very attenuated, bears quantities of black seed, and is quite inedible. The stalks might, however, be utilised for fibre-making. The three best known of these native bananas are—

Musa Banksii.—Fruit yellow, seed-bearing.
Musa Fitzalani.—Fruit yellow, seed-bearing.
Musa Hillii.—Very yellow, seed-bearing.

THE QUEENSLAND BANANA TRADE.

The magnitude of the Queensland Banana trade during the years 1901 to 1905 may be learned from the following figures showing the shipments from Geraldton (Innisfail) alone. Compared with the statistics for 1909, beyond which year we have no State records, the tremendous falling off in the trade may well give rise to the question, What has brought such a result about? I do not propose to suggest any political factor as entering into the question, but the fact remains that the depreciation of Queensland Bananas in the Southern Markets, especially in Victoria, is due to two causes. One is, the facilities afforded to Fiji growers to place their fruit on the Australian Market, by means of subsidised steamers, by the inadequate protection afforded to Queensland growers by the low protective duty. The other is, unfortunately, the fault of the Northern growers themselves. Instead of allowing the fruit to fill and then cutting it in such a condition that it will gradually ripen on the voyage South, and yet land in perfect condition,

the bunches are cut whilst the fruit is still in a very immature condition. The result is that such fruit will not ripen at all properly, and it cannot be wondered at that very low prices are obtained for it, or that much is condemned on arrival at the port to which it is consigned. So low a price was obtained in 1911 for our Bananas in the Southern Market that it was reported that thousands of bunches were cut and destroyed by Chinese growers in the North, as it would not pay to ship them.

I have omitted the item of freight, which is, as may be supposed, a considerable factor in the expenses.

RETURN OF BANANAS SHIPPED FROM GERALDTON FROM 1ST JANUARY, 1901, TO 31ST DECEMBER, 1904.

(From November, 1903, the Ports of Ella Bay and Liverpool Creek are included; previous to November, 1903, Bananas are from Geraldton only.)

—	Year ending December, 1901.	Year ending December, 1902.	Year ending December, 1903.	Year ending December, 1904.
Bunches, Melbourne and Sydney	657,525	692,905	818,900	1,257,446
Cases, each 4 Bunches, Adelaide	91,660	166,816	79,704	109,872
Crates, each 25 Bunches, Queensland ..	566,175	374,354	418,895	320,220
Total Bunches	1,315,360	1,234,075	1,317,499	1,687,538

RETURNS SHOWING SHIPMENTS OF BANANAS FROM THE PORTS OF GERALDTON, ELLA BAY, COWLEY, AND TULLY RIVER FOR THE YEAR 1905.

—	Geraldton.	Cowley.	Ella Bay.	Tully River.
Bunches to Sydney and Melbourne ...	836,091	192,059	71,193	88,309
Cases to Adelaide	50,415	1,878	5,457	4,452
Crates to Queensland Ports	12,225	2,921	1,711	335
Total Bunches	898,731	196,858	78,361	93,096
Cases Oranges to Queensland Ports ...	...	...	...	1,860

VALUE OF FRUIT AND TIMBER, 1904 AND 1905.

	1904.		1905.
Fruit Value	£126,564	...	£129,134
Value of Timber (Cases) ...	3,400	...	4,792

NOTE.—The cases, which are made of silky oak and maple, are sold in Sydney, Melbourne, and Adelaide. Crates of rough silky oak, which have contained bananas, may be bought in Brisbane at from 4d. to 6d. each.

Bananas exported from the Northern Ports during the first half of the years below mentioned, January to June, being the season in the trade:—

1st January to 30th June, inclusive—

	Bunches.
1904	901,416
1905	1,087,352
1906 (cyclone year)	631,195
1907	673,428
1908	622,065
1909	469,383
1910	458,388
1911	350,203

In 1908 there was a considerable decline in the area under Bananas in Queensland; but in 1909 the freshly planted areas brought the position back to that obtaining in 1907, which, however, still left the acreage considerably short of that obtaining in previous years.

In 1909 there were 4,994 acres under Bananas, against 4,647 acres in 1908—an increase of 347 acres in the latter year; but, from the smaller area in 1908, 1,651,163 bunches were obtained, whilst in 1909 the crop only amounted to 1,396,567 bunches, a decrease of 254,596 bunches. These figures give average yields per acre of—1908, 355 bunches; 1909, 280 bunches. The average yield for the past eleven years was 306 bunches per acre.

In 1910 there were 5,198 acres planted with Bananas, the produce amounting to 1,121,075 bunches.

The quantity exported cannot here be given, as there are no longer any State records of the quantity of fruit exported.

For 1909 the exports and their value were as follow:—

	Centals.	£
New South Wales	28,765	10,770
Victoria	127,511	40,030
South Australia	40,103	17,071
Western Australia	10,432	8,304
Tasmania	8	9
	206,819	76,184

The actual annual production of Bananas in this State amounts usually to some 2,000,000 bunches, much of which, of course, is consumed in the country.

THE PROFITS OF BANANA-GROWING.

I am not in a position to state the profit made by banana-growers in Queensland; but it probably approximates the profits made by West Indian planters, as elicited by Mr. W. A. Smith, general manager of the Trinidad Railway, who was sent by the Agricultural Society of Trinidad to inquire into and report upon the methods of handling, transporting, and shipment of Bananas and Oranges in Jamaica, and in his report he gives some figures as to profits which are interesting. He took an estate of 300 acres, of cultivated cane land principally, which had been in cultivation about three years. The cost of clearing and preparing the land—ploughing, planting, weeding, and pruning—was a little over the average of £10 per acre. The initial expenses were fully realised with the first fruiting, after which the net clearance each year amounted to not less than £10 per acre. This is typical of many estates, both where irrigation is carried on and otherwise. An acre of Bananas planted, say, 14 ft. by 12 ft., will give roughly 250 plants, or three stems to each stock. Under good tillage and with average luck, these should produce not less than 300 bunches annually, extending over the ratooning period, which varies from 3 to 6 years. To be on the safe side, take 260 full-paying bunches, which realise an average price of 1s. 6d. The gross revenue

comes to £19 10s., and, after deducting say 45 per cent. for general management, including propping the fruit stems, reaping, carting, and interest on capital, the net clearance is not less than £10 per acre.

One hundred acres of Bananas in full bearing, under average conditions of soil, cultivation, and rainfall, would therefore mean an income of £1,000 a year. Mr. Smith, who is in charge of the Trinidad section of the exhibition at the Crystal Palace, says he should be inclined to say that these figures, which applied to last year, should now be reduced by 25 per cent., owing to the reduction in prices consequent upon the monopoly that has been established. But, even if this reduction be made, a profit of £7 10s. per acre is a very handsome one.

Statistics.

COMMONWEALTH METEOROLOGY.

RAINFALL OF QUEENSLAND.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1911.							1912.						During the 5-day period, 21 to 25 June.
	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	
North.														
Ayr	...	...	...	...	...	...	...	...	...	3 53	1·16	1·01	6 70	2·33
Bowen	0·2	Nil	0·15	Nil	1·5	0·19	1·32	1·56	3·15	1 86	0·59	1·76	3·78	1·62
Cairns	1 44	1·48	0·27	0·6	0·88	1·95	0·90	4 81	16·68	5·95	4·71	5·97	8·00	6·90
Geraldton (Innisfail)...	5·10	6·20	0·79	0·30	0·73	1·61	0·75	5·50	18·24	6·01	56·14	41·84	15·25	9·60
Gindie State Farm ...	Nil	Nil	0·49	...	0·81	...	3.50	0·68	2·59	1·88	0·63	...	9 94	8·68
Herberton	0·36	0·40	0·5	Nil	0·9	0·62	5·36	5·29	2·82	1·47	1·40	2·20	2·36	1·17
Hughenden	0·2	0·2	Nil	Nil	Nil	1·37	0·69	5·78	1·84	3·52	Nil.	0·74	6·64	1·60
Kamerunga State Nurs.	...	...	...	...	...	...	...	...	...	...	*	...	...	...
Mackay	0·22	0·43	0·18	0·3	0·93	0·17	0·41	2·08	8 04	·93	3·56	3·42	5·51	3·62
Mossman	0 33	1·28	0·39	0·09	0·55	0·86	3 31	6·06	18·32	17·60	6·40	2·78	8·88	...
Rockhampton	Nil	0·24	1·17	Nil	0·40	0·6	0·81	2·50	3·24	·14	0·01	1·98	8·38	3·92
Townsville	0·11	Nil	Nil	Nil	0·39	0·31	2·84	1·64	7·57	6·35	4·51	0·63	4·49	0·92
South.														
Brisbane	0·9	1·70	2·22	0·84	4·95	0·84	1·94	1·85	2·13	1·03	0·72	0·20	7·22	4·25
Bundaberg	Nil	0·37	1·15	Nil	2·36	1·30	2·98	3·96	2·47	...	Nil.	1·33	10·23	2·72
Bungeworgorai (Roma State Farm)	...	...	...	...	...	...	...	0·73	...	2·19	Nil.	...	7·06	...
Crohamhurst	0·13	3·58	2·62	0·51	6·27	1·74	3·02	5·62	8·72	13·73,	1·77	1·39	9·99	...
Dalby	Nil	0·68	0·43	0·42	3·45	1·99	1·55	1·76	2·58	·53	Nil.	Nil	4·76	2·08
Esk	Nil	...	1·51	2·04	4·17	0·47	0 44	1·38	8·26	·22	0·36	0·11	7·43	4·06
Gatton Agric. College	Nil	0·72	0 90	0·96	3 77	0·49	1·90	3·56	3·31	7·86	0·31	...	6 63	...
Gympie	Nil	0·97	0·48	0·26	2·42	0·50	2·10	2·92	4·47	·15	0·37	0·52	2 63	2·63
Ipswich	Nil	0·59	1·12	0·34	4·71	0·25	...	1·87	3·00	·41	0·30	Nil	3·93	3·93
Maryborough	0·11	0·62	1·47	0·9	2·81	0·90	4·98	2·39	3·93	·11	0·32	1·09	9·12	3·34
Roma	Nil	0·67	1·55	0·87	1·9	1·55	1·19	0·74	0 76	·85	0·03	Nil	7·96	1·48
Tewantin	0·22	2·53	1·07	0·4	7·48	1·14	2·13	5·60	4·25	·85	0·80	8·46	8·72	4·52
Toowoomba	...	...	...	...	...	...	...	...	...	·52	0·66	0·16	6·75	2·77
Warren State Farm ...	Nil	0·6	1·01	...	0·64	...	...	0 82	1·75	2·04	0·22	1·28	9 51	
Ditto (11 days) ...	...	...	...	...	...	...	...	...	...	...	...	...	...	9·51
Warwick	Nil	1·20	1·50	0·80	1·78	2·26	0·70	1·57	·5	·56	0·02	0·9	5·69	3·15
Warwick, Hermitage State Farm ...	...	...	...	...	0·60	...	...	...	...	...	...	...	...	...
Westbrook State Farm	...	...	...	...	...	...	...	...	...	...	Nil	...	...	...
Woodford	...	...	...	...	...	...	...	...	...	...	...	...	9·78	4·46
Yandina	Nil	2·43	Nil	0·30	2·90	1·36	1·87	5·95	4·84	·95	0·88	1·39	7·42	3·20

NOTE.—The rainfall data in this table are compiled from telegraphic reports, and must be considered as approximate only. * No Report.

GEORGE G. BOND, Divisional Officer.

Tropical Industries.

THE CAROB BEAN.

This useful tree, which attains a height of from 30 to 50 ft., is a native of Southern Europe, Egypt, and Asiatic Turkey. It goes by various names, such as Locust Bean, Sow's Bread, Camel's Bread, St. John's Bread, Mesquit Bean, and Algaroba. In Germany the dried pods, which are about 8 in. long, and nearly 1 in. in width, are sold in the markets, and are much liked by children for their sweetness. There they go by the name of Johannes Brod, as it is popularly supposed to be the "Locust" which is stated in Scripture to have been part of the food of St. John.

Mr. G. Brooks, when overseer of the Kamerunga State Nursery in 1900-1901, wrote two excellent articles on this tree, which had been acclimatised there, and bore a good crop of fruit in the latter year, when many hundreds of seeds were supplied to applicants. He specially recommended it as food for stock, and, as a matter of fact, the bean is largely used, especially in Portugal and Turkey, for farm stock, and for domestic use. During the Peninsular War in 1811 and 1812, the Carob bean formed the principal food of the British cavalry and artillery horses. The beans and pods are largely used in the manufacture of brandy, of the essence of pineapple, of chocolate, and of liquorice. The tree is of slow growth, and the timber is extremely hard, durable, and takes a good polish.

It adapts itself to all kinds of soil, provided the latter is dry, and thrives very well on stony ground, and on limestone rocks, dry clay lands, and volcanic lava. In rich, deep, well-drained soil it grows to perfection and attains an enormous size. It resists the effects of drought and remains unaffected where even the olive will droop and die. It produces flowers containing both the male and female organs, and sometimes male and female flowers separately on the same tree; and again, some trees, like the papaw, are wholly male or wholly female. To ensure, therefore, the fruitfulness of all the plants, it is best to graft them, and this is done in the nursery when the plants are about 2 ft. high. From the nursery they are put into a plantation about 3½ ft. apart, and at the age of four or five years they are moved to their permanent positions. The flowers are generally borne on the older branches, and even on the stem. The green fruit changes, as it ripens, to a chocolate colour. The pods are collected by hand, or beaten down with a pole. When gathered they are spread on the floor to dry or laid in alternate layers in straw. If collected in heaps they will ferment and turn black. They must be quickly made use of or they will fall to pieces, become white and worm-eaten. The annual yield of an adult tree is from 8 to 20 cwt., and full-grown trees bend under the great weight of pods. The entire pod is eaten, and it is very sweet to the taste.

Large quantities are annually exported from Cyprus and Crete. From the latter island alone 180,000 tons have been exported in one year, most of which found its way to England. In Malta it is the predominant tree. As to climate, it may be said that the Carob will succeed wherever the orange will grow without protection in the winter. It is less hardy than the olive, and will not thrive at an elevation where the olive is productive.

Mr. G. Brooks, who has practical experience of the cultivation of the Carob in North Queensland, gave the following hints regarding germination of the seed and propagation of seedlings (*Queensland Agricultural Journal,* April, 1901, page 282, Volume VIII.) :—

"In sowing the seed, a loose open soil made up of equal parts of rich loam or vegetable matter and sand is the best. The seeds should be only just covered, for if planted deep, especially in the cold weather, they will frequently lie dormant for some considerable time. In such cases, when the soil is stirred up, the seed will readily germinate in the spring or on the approach of warm weather. This is a point that should be noted, for seeds so planted, especially in the cooler portions of the State, are frequently looked upon as unfertile if they do not speedily show signs of vitality.

"After germination, the principal thing to guard against is over-watering. Some cases have come to notice where the young seedlings have damped off, but this was in the Northern coastal districts and in moist hot weather. In the cooler portion of the State this need not be feared, however, unless obviously over-watered. There is no mistaking young seedlings, for, like many other plants of this family, they raise the seed itself above the ground, which remains there for some short time until the seed lobes open, the typical Algaroba leaf not making its appearance for some days subsequent to this. The young seedlings grow very long taproots; plants of 4 in. in height have been found to have taproots of fully 18 in. in length. This necessitates careful handling if transplanting is contemplated. If the seeds are not sown where the tree is to permanently remain, shallow boxes or tins, say 6 in. deep, filled with the compost already referred to, are preferable to ordinary garden beds. This method prevents the taproot from going too deep, and encourages a fibrous growth of root without detriment to the plant. On transplanting seedlings grown in this way, care must be taken in separating the roots when entwined, which will occur if the seed has been at all thickly sown. Otherwise the transplanting of seedlings thus propagated is much safer than that of those grown in garden beds, and, if carefully done, very few failures will result."

BUD-ROT IN THE COCOANUT.

Now that North Queensland planters are beginning to turn their attention to the cultivation of the cocoanut, it is well that they should be supplied with all possible information not only as to the methods of cultivation, and the preparation of copra, as well as the utilisation of

the husk in the manufacture of coir rope, but also as to the diseases and pests to which the cocoanut is liable. The *Tropical Agriculturist* for April publishes the following useful notes on Cocoanut Bud-rot, the results of American investigations into this ruinous disease:—

In writing last week on Cocoanut cultivation abroad, we made reference to the ravages caused by this disease in Cuba, where it has practically ruined the industry. The disease has been known in the West Indies for more than thirty years; but in Ceylon it would appear to have been first brought to official notice in 1906, when a short circular on the subject was issued by Mr. Petch, Government Entomologist.

Since that year the disease has formed the subject of special investigation by Mr. John R. Johnston, Assistant Pathologist to the U.S.A. Department of Agriculture, who, after making exhaustive researches, has issued a comprehensive report (Bulletin No. 228), in which he announces that the disease is caused by *Bacillus Coli,* or at least an organism indistinguishable from it. This bacillus is of almost universal distribution, and is commonly found in the intestines of man. The virulence of the disease in Cuba will be realised from the following facts: A grove of 450 trees was totally destroyed in two years; another grove was reduced from 1,200 to 300 bearing trees within the same period; a planter who once derived a revenue of £5,000 per annum now gets barely £500.

These facts should serve as a warning to our local planters to take every possible precaution to prevent the disease, which already exists in the Island, from assuming an epidemic form. Being of bacterial origin the malady is easily communicated by animals, birds, and insects, and when once attacked a tree may be killed in two months or take a year or more before it succumbs. The early symptoms are the yellowing and falling of the leaves and the dropping of immature nuts. Eventually the middle folded leaves bend over, and the entire heart is involved in a vile-smelling soft rot.

It is somewhat discouraging to be told that the application of various fungicidal mixtures, as remedies, gave unsatisfactory results. The only treatment recommended is of a preventive character, viz., to cut down all diseased trees and destroy them by fire, burning at the same time all *débris* consisting of fallen nuts, leaves, &c. In addition to this it is recommended that plantations should be maintained in a sanitary condition and proper methods of cultivation practised.

It is interesting to note that while previous investigators differed in their diagnosis of the primary cause of bud-rot, some attributing it to a fungus, others to insects, and so on, Mr. Petch himself, so far back as 1906, was satisfied (see page 224 of his circular) that the organisms responsible for the decay were bacteria, and recommended the felling and burning of diseased trees. He further condemned the close planting which prevails in many gardens as favouring the spread of disease by preventing the evaporation of moisture from the young shoots.

The village cultivator has yet to learn that fruit-bearing plants need a good supply of sunlight and air, and a definite feeding area for root

development, to ensure proper nutrition and promote their yielding capacity. The commonly-prevailing idea would seem to be—more plants, more fruit.

On estates under intelligent supervision the carrying out of the recommendations referred to may be reckoned upon, and, indeed, in many cases the details as to sanitation and cultivation are already receiving attention; but the constant occurrence of neglected areas in the neighbourhood of estates is a serious menace to the industry, as providing foci for the spread of insect and fungoid pests. One would imagine that the Lowcountry Products Association, which is so greatly interested in the cocoanut industry, would have conceived the idea of formulating some scheme for the maintenance of plantations in a sanitary state, with a view chiefly to improving the condition of the scandalously neglected gardens so frequently met with—rank with noxious weeds and decomposing *débris*. If pressure in some form could be brought to bear upon the owners or lessees of such properties, the advantage would be twofold, inasmuch as it would remove an existing danger to cultivated estates, and at the same time ensure better returns to the parties who have an interest in the neglected lands. Could not the services of the instructors employed by the Agricultural Society be utilised in this connection? The report under review, consisting of 175 pages, is illustrated by 14 plates and 10 text figures, which considerably enhance its value.

We can only congratulate Mr. Johnston on the satisfactory conclusion of his arduous labours and the service he has rendered not only to the American dependencies but to the tropical world at large.

RAMIE.

That the cultivation of this fibre plant will eventually be carried on in tropical countries other than China may be looked upon as certain. Up to the present the neglect of this, the finest of all fibre plants, has been due to the failure of any machine yet invented to deal with the plants. Ramie grows in many parts of Queensland, where it has been experimentally tried, luxuriantly. Even in Southern Queensland, in the neighbourhood of Brisbane, patches of Ramie may be seen, in which the stalks are from 4 to 5 ft. in height. The plant belongs to the order of nettles, and grows as luxuriantly and with as little trouble as that well-known lowly plant.

At the Fibre Congress, held at Sourabaya in July, 1911, a very exhaustive paper on Ramie was read by Mr. H. C. Bluntschli, Director of the Midden Sumatra Handel Maatschappij at Siak, Sumatra. We have not space to publish the whole of the gentleman's admirable description of the plant, its manufactures, and its possibilities, which has been kindly forwarded to us by Mr. C. Hildebrand, late of 56 Hunter street, Sydney, now of 17 Göbensh, Oberhausen, Westphalia, Germany,

who translated the paper into English. We make the following extracts, however. Respecting the value of Ramie fibre, Mr. Bluntschli said:—

"There can be no doubt that Ramie is a very valuable fibre plant. It seems almost impossible to name an industry where Ramie fibre could not be utilised. At the present time Ramie is principally used for manufacturing yarns for fish nets, balloon nets, material for filters, raincoats, motor-car caps, serviettes, plush, window curtains, imitation of Brussels lace, bandages, hosiery, stockings and socks, cigarette paper, a particularly strong and durable kind of paper for official documents, paper for banks, &c. The use of Ramie fibre is nowadays quite general, and the reason is probably its extraordinary strength and durability. In strength Ramie is equal to linen, in subtlety to cotton fibre. It possesses the shine of silk and the quality of absorption of wool. It is about three times as strong as the best Russian hemp. It is not adhesive, and the webs become whiter with use. At the present time it is not more expensive than hemp, but there is a good chance of Ramie becoming much cheaper in the future. At the great exhibitions in the different countries the articles made from Ramie have always particularly called for attention. In 1851, for instance, a certain Mr. L. Weber, from Tjogrek (Java), was awarded a medal at the London Exhibition for various articles made from Ramie, and at the Paris Exhibition, in 1878, about 100 different articles made from Ramie were exhibited. These came principally from Europe and America. At the present time it would be quite possible to organise an exhibition exclusively devoted to the culture of Ramie and its fabrics.

" The following will deal with all the different questions concerning the culture of Ramie and its treatment, &c. From the above may be gathered the great difficulties in connection with Ramie and how same can be overcome. It may be pointed out that at the present time Ramie fibre is used in nearly all countries, either by the name of Ramie or by other names. The demand for this article is therefore exceptionally great.

"It is true that a machine for which, during the years 1869-1872, the British Indian Government offered a reward of £5,000, has not yet come into existence. This machine was to manufacture a product at once suitable for the spinning mill, at a cost price of £15 per ton c.i.f. Liverpool. However, since then methods have been found to treat the fibre properly, and at the present state of science the culture of Ramie and its use in the industry has no difficulties to offer which cannot possibly be overcome. It will just be the matter of following the example of previous meetings by collecting and communicating all interesting facts, and also the experience of planters, so that the many misunderstandings, resulting from the different ideas of Ramie planters and consumers in regard to the treatment of the fibre, will be removed. and everybody will get the necessary clear and distinct idea of the article. Everybody who is interested in Ramie, or used to be interested in this commodity, will have to admit that Ramie, its cultivation and

treatment, requires more knowledge and experience than he had heretofore possessed. Let us therefore communicate all our impressions, and let us all contribute anything likely to be of interest, so that finally good results will be arrived at.

"There are about 100 species known, as for instance:—

"(*a*) Urticaceæ: utilis, rustica, heterophylla, dioica, urens, urentissima, stimulaus, cremulata, argentea postulata, baccifera.

"(*b*) Bœhmeriæ: nivea, tenacissima, candicaus, fructesceus, makrophylla, platyphylla.

"As far as I know, two species, utilis and heterophylla—the nilgrin nettle growing in British India—are the only species cultivated.

"For cultivation the Bœhmeriæ is undoubtedy best suited, and of that variety again the nivea, and perhaps some species of nivea so far not separately classed, for Ramie is a very sensitive plant which may easily alter its qualities when introduced to another climate or different kind of soil. The fact that 'nivea'—this term has been adopted on account of the snowy white colour of the back of the leaves—is best suited for cultivation is based on the fact that Ramie grows well in most countries, as Java, Sumatra, China, Siam, Burma, Egypt, and also France. The species of Ramie cultivated in China for the textile industry also belongs to the nivea variety.

"Less frequently, and even rarely, the so-called green Ramie, whose leaves are of a light green colour at the back, and possess a very strong fibre, is met with. However, from this plant long stalks can only be obtained with difficulty. I myself have seen Ramie in all countries under any possible conditions of soil up to a height of several thousand feet, and also in the low land and in close proximity of the sea.

"From serious investigations and attempts at the Buitenzorg Botanical Gardens at Tjikeumeuh, where at least eight different sorts of Bœhmeriæ were closely examined, and also from the experience of the International Fibre Congress at Paris, it may be reasonably assumed that the natural fibres of all sorts of Urticaceæ may be used for making cordage and also in the place of jute and flax, whilst for textile purposes only the Bœhmeriæ may be used, which in the least possible time can produce the longest stalks. And these long stalks are, on account of the straight parallel position of their fibre, highly important for industrial purposes. At the Paris Congress a species of Ramie, which frequently branches off and shows no long stalks, was definitely condemned.

"Ramie belongs to the perennial shrubs, but can also be cultivated as an annual. This latter method has been adopted in many parts of China.

"As has been said previously, Ramie can be cultivated on almost any soil. Only hard clay or dry sandy ground should be avoided. However, as will be seen later on, quite different items should be taken

into consideration for the cultivation of Ramie, especially if textile purposes are concerned. Although it is quite possible to obtain strong fibre from Ramie growing indigenous, it is doubtful whether such Ramie will be suitable for the treatment by machinery, and whether a good financial success could be obtained.

"As a perennial plant Ramie develops a very strong root-stock with globular rhizomes, which gradually increase in size and devolop roots, either in the ground or on the surface and in all directions, in same proportion as feeding matter is contained in the soil. From this stock the 'nivea' develops stalks, which in the beginning amount to five, then ten to twenty, and afterwards fifty and more stalks, of one or two metres length, so that a Ramie plantation eventually looks like a paddock of 'Alang Alang grass.' Each stalk attains a weight of 100 to 200 grammes, and has a diameter of one to two centimetres.

"The female plant shows thick bundles of small seed bags at the top of the stalk underneath the crown of leaves.

"The Ramie stalks consist mainly of a more or less liquid substance, which explains the fact of its sensitiveness for warmth, wind, &c.

"Three per cent. of the weight of the green stalks forms the contents of fibre in a dried state, together with the gum of the plant.

"Under the most favourable conditions a crop lasts about six weeks, and—but this is only possible under the most favourable of circumstances—two crops may be expected in Europe and also in China. Five crops may be expected in the tropics.

"Ramie may easily be propagated from seed or by division of stalks. On a small scale Ramie grows best on spots with plenty of shade, and large plants are sometimes met with on protected spots.

"For a cultivation on a large scale, one has to be careful to protect the plants against too much light, draught, or humidity, and also against the wind."

[TO BE CONTINUED.]

PLANT CANES.

BY H. T. HARVEY, Instructor in Cane Culture.

The photograph depicts a block of young plant cane growing on the property of Mr. J. Rae, Bundaberg. The whole of the block was planted at the same time, and all with one variety—namely, Demerara 1135. The vigorous cane on the right-hand side of the picture is from sets cut from first ratoon cane, six months old. The poor cane on the left-hand side is from sets cut from old ripe plant cane. On looking closely into the picture it will be seen that nearly half of the sets cut from the matured cane have failed to germinate.

The photo. illustrates very clearly the gain or loss a farmer may experience according to the quality of the sets used in planting. Matured cane, rich in sugar, should never be used for planting if it can be avoided. Young cane which is full of growth will always strike more rapidly and throw out stronger shoots than canes rich in sugar.

Plate 21.—Plant Sugarcane

TO TRAP SPARROWS.

Mr. Hindes, Poultry Expert at the Queensland Agricultural College, Gatton, mentions an effective sparrow-trap, a description of which was sent to "The Australian Hen," by Mr. Day, of Springwood. Mr. Day said that he had succeeded in trapping a number of sparrows by the following method:—He built a coop 6 by 3 by 3 ft., which he covered with small-mesh wire netting, leaving a small hole at the centre of the top, immediately under which he swung a board on wires, upon which a few grains of wheat were placed. The sparrows entered at the hole mentioned, but failed to find their way out again, and were thus easily caught. This is a device worth trying, as it is surprising how much grain a flock of sparrows will consume during the year. Mr. Hindes has now in the Press a pamphlet on "Poultry Farming," which will very shortly be issued by the Department of Agriculture and Stock. Such a work has long been needed as a help, not only to beginners but to many who make a business of poultry-raising and egg production for the market.

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

BY F. MANSON BAILEY, C.M.G., F.L.S., COLONIAL BOTANIST.

Order CELASTRINEÆ.

CELASTRUS, Linn.

C. Cunninghamii, F. v. M., var. **parvifolia,** Bail. A small tree with rather dense foliage. Leaves more or less apiculate, somewhat cuneate, 4 to 12 lines long, 1 to 2 lines broad, deep-green. Flowers small and solitary. Capsule slightly broader than long, smaller than in the normal form, yellow; seed reddish-purple, nearly enclosed in a yellow arillus.

Hab.: Chinchilla, *R. C. Beasley.*

Order COMPOSITE.

ZINNIA, Linn.

Z. pauciflora, Linn. An erect annual; leaves from lanceolate to oblong-ovate, commonly with a subcordate base, scabrous; peduncle sometimes nlarging and hollow. Involucre narrow-campanulate. Ray-florets from obovate to narrowly spathulate, red, purple, or yellow. Achenes of the disk 1-awned, sometimes with a rudiment of a second awn or tooth. *Zinnia multiflora,* Linn.; Bot. Mag. 149.

Hab.: A native of Louisiana and Texas, North America; now a naturalised weed on the Darling Downs, *Dr. F. Hamilton Kenny.*

*ACHILLEA, Linn.

Heads small, corymbose, heterogamous, and rayed, or homogamous and disciform; ray-floret few, female, rarely neuter; ligule short, white, pink, or yellow; disk-florets hermaphrodite, fertile, tube terete or compressed and 2-winged, base often produced over the top of the achene, limb 5-fid. Involucral bracts in few series, appressed; margins often scarious and black, outer shorter; receptacle flat or elevated, scales membranous. Anther-bases obtuse. Style-arms of the hermaphrodite florets with truncate and penicillate tips. Achenes oblong or obovoid, dorsally compressed, glabrous, with 2 cartilaginous wings; pappus none. Perennial pubescent or villous herbs. Leaves alternate, narrow, serrulate, or pinnatisect. The genus is supposed to contain about 100 species, of temperate Northern regions.

A. tanacetifolia, Allioni. A perennial, creeping at the base, the upright stems slightly branched, more or less prominently ribbed, pubescent, or villous. Leaves oblong-lanceolate in outline, bipinnatisect, the rhachis or

PLATE 22.—CELASTRUS CUNNINGHAMII, *F.v.M. var.* parvifolius, *Bail. n. var.* *A,* flower-bud; a^1, bracts; a^2, pedicel; a^3, calyx lobes; a^4, petals. *B,* flower: *C,* stamen; *D,* pistil; *E,* capsule; *F,* seed with its arillus; *G,* a single leaf to show veining. *A—D* enl., *E—G* nat. size.

midrib prominently bordered, lobes numerous, closely toothed, the lower leaves often very long, the upper half stem-clasping. Inflorescence a thick terminal corymb of reddish-purple flowers; ray-florets 5, 3-lobed.

Hab.: Southern Europe; now naturalised on the Darling Downs, *Dr. F. Hamilton Kenny.*

Order LORANTHACEÆ.

LORANTHUS, Linn.

L. Quandang, Lindl., var. (?) **amplexifolius,** Benth. Leaves broad, sessile, cordate.

Hab.: Johnstone River, *Dr. T. L. Bancroft.* Evidently a form of the above variety, but should be compared with typical specimens.

L. Quandang, Lindl., var. **Bancroftii,** Bail. n. var. (Plate 23). The whole plant more or less puberulent. Leaves bluntly lanceolate, the base truncate, rounded, then tapering to a short petiole, 2-3½ in. long, ½-1¼ in. broad, coriaceous ; longitudinal nerves 5, the three central ones more prominent than the others. Inflorescence much resembling other forms. Filaments and style of a rich purple.

Hab.: Eidsvold, *Dr. T. L. Bancroft.*

Order FUNGI.

The following additions to our Fungi have been determined at Royal Botanic Gardens, Kew, England :—

HYMENOMYCETES.

Favolus princeps, Berk.

Hab.: On logs, Coomera River, *Tryon and White.*

PYRENOMYCETES.

Trabutia eucalypti, Cke. et Mass.

Hab.: On leaves of *Eucalyptus siderophloia,* var. *rostrata,* Maryborough district.

Rosellinia mammoidea, Sacc.

Hab.: On drift wood, Moreton Bay, *C. T. White.*

Pleospora vulgaris, Niessl.

Hab.: On dead stems of *Xanthium strumarium,* Brisbane River, *C. T. White.*

Didymosphæria banksiæ, Cke. et Mass.

Hab.: On leaves of *Banksia integrifolia,* Coolangatta, *C. T. White.*

Hypsophila eucalypti, E. M. Wakefield, Kew Bull. 1912, p. 190.

Hab.: On leaves of Eucalyptus sp., Darra, *C. T. White.*

Sphærella nubilosa, Cke.

Hab.: On leaves of Eucalyptus spp., several localities in South Queensland, *C. T. White.*

Asterina microthyroides, Wint.

Hab.: On leaves of *Eucalyptus siderophloia,* var. *rostrata,* Eidsvold, *Dr. T. L. Bancroft.*

Plate 23.—Loranthus Quandang, *Lindl. var.* Bancroftii, *Bail. n. var*

Order ALGÆ.

The following additions to our Marine Algæ (seaweeds) have been determined by Mr. A. D. Cotton, Royal Botanic Gardens, Kew, England :—

FAMILY NEVACEÆ.

Enteromorpha Gunniana, J. Ag.

Hab. : Coolangatta, *C. T. White.*

FAMILY CLADOPHORACEÆ.

Cladophora albida, (Huds.) Kuetz.

Hab. : Coolangatta, *C. T. White.*

FAMILY CHÆTANGIACEÆ.

Brachycladia marginata, Soland. ; **forma dilatata,** (Kuetz) J. Ag.

Hab. : Coolangatta, *C. T. White.*

FAMILY GELIDIACEÆ.

Gelidium pusillum, Le Jol.

Hab. : Coolangatta, *C. T. White.*

FAMILY SPHÆROCOCCACEÆ.

Gracilaria Lucasii, Gepp., in Journ. Bot. 44 (1906) p. 256.

Hab. : Moreton Bay, *C. T. White.*

TIMES OF SUNRISE AND SUNSET AT BRISBANE; 1912.

DATE.	MAY.		JUNE.		JULY.		AUGUST.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·31	5·0	6·40	5·3	6·30	5·18
2	6·14	5·15	6·31	5·0	6·40	5·4	6·30	5·18
3	6·15	5·14	6·32	5·0	6·40	5·4	6·29	5·19
4	6·15	5·13	6·32	5·0	6·40	5·4	6·29	5·20
5	6·16	5·13	6·33	5·0	6·40	5·4	6·28	5·20
6	6·17	5·12	6·33	5·0	6·40	5·5	6·28	5·20
7	6·17	5·12	6·34	5·0	6·40	5·5	6·27	5·21
8	6·18	5·11	6·34	4·59	6·40	5·6	6·26	5·21
9	6·18	5·10	6·35	4·59	6·39	5·6	6·25	5·22
10	6·19	5·10	6·35	4·59	6·39	5·7	6·24	5·23
11	6·19	5·9	6·35	4·59	6·39	5·7	6·23	5·23
12	6·20	5·9	6·35	4·59	6·39	5·7	6·22	5·24
13	6·20	5·8	6·36	4·59	6·39	5·8	6·21	5·25
14	6·21	5·8	6·36	4·59	6·39	5·8	6·20	5·25
15	6·21	5·7	6·36	4·59	6·39	5·9	6·19	5·26
16	6·22	5·7	6·37	4·59	6·38	5·9	6·18	5·26
17	6·22	5·6	6·37	4·59	6·38	5·10	6·17	5·26
18	6·23	5·6	6·38	5·0	6·37	5·11	6·16	5·27
19	6·24	5·5	6·38	5·0	6·37	5·11	6·16	5·27
20	6·24	5·5	6·38	5·0	6·36	5·12	6·15	5·28
21	6·25	5·4	6·38	5·0	6·36	5·12	6·14	5·28
22	6·26	5·4	6·39	5·1	6·36	5·12	6·13	5·28
23	6·26	5·3	6·39	5·1	6·35	5·13	6·12	5·29
24	6·27	5·3	6·39	5·1	6·35	5·13	6·11	5·29
25	6·27	5·2	6·39	5·1	6·34	5·14	6·10	5·30
26	6·28	5·2	6·39	5·1	6·33	5·15	6·9	5·30
27	6·28	5·1	6·40	5·2	6·33	5·15	6·8	5·30
28	6·29	5·1	6·40	5·2	6·32	5·16	6·7	5·31
29	6·29	5·1	6·40	5·2	6·32	5·16	6·6	5·31
30	6·30	5·0	6·40	5·3	6·31	5·17	6·5	5·32
31	6·30	5·0	...	...	6·31	5·17	6·4	5·32

PHASES OF THE MOON.

			H. M.
1 May	○	Full Moon	8 19 p.m.
9 „	☽	Last Quarter	7 56 „
17 „	●	New Moon	8 14 a.m.
24 „	☾	First Quarter	12 11 „
31 „	○	Full Moon	9 30 „
8 June	☽	Last Quarter	12 36 p.m.
15 „	●	New Moon	4 24 „
22 „	☾	First Quarter	6 39 a.m.
29 „	○	Full Moon	11 34 p.m.
8 July	☽	Last Quarter	2 47 a.m.
14 „	●	New Moon	11 13 p.m.
21 „	☾	First Quarter	3 18 „
29 „	○	Full Moon	2 28 „
6 Aug.	☽	Last Quarter	2 18 p.m.
13 „	●	New Moon	5 58 a.m.
20 „	☾	First Quarter	2 57 „
28 „	○	Full Moon	5 59 „

Vegetable Pathology.

A STRAWBERRY DISEASE.

DUE TO THRIPS' INJURY.

By HENRY TRYON, Government Entomologist and Vegetable Pathologist.

A strawberry-plant disease, locally more or less prevalent in certain parts of Southern Queensland, and whose cause and exact nature has until lately been unascertained, having been lately inquired into, the following account of a typical instance of such an occurrence is herein recorded:—

Occurrence.—It was met with in two plots of strawberry plants comprising an area of about ½ acre, and although other varieties manifested its presence, the one named "Glenfield Beauty" seemed to be the most injured, but it is not to be inferred that this is most susceptible to injury until more extended inquiry has been made. Plants affected showed every degree of injury short of complete destruction, being commonly, however, rendered wholly unprolific.

Symptoms.—With regard to general features presented it may be stated that the plants affected, if already well grown, possessed a somewhat "bunched" instead of an open habit of growth—a feature apparently due to the shortening and curvature of the leaf stalks. The leaf blades were again somewhat infolded and contorted, with the upper surfaces more or less infused with a darkish purple colour, variable in intensity, but sometimes very pronounced. The leaf stalks, again, instead of being green were of a dark reddish brown colour. An unusual number of fruits had stopped growing at a very early stage, and were in many cases brown, black, or already dead. More developed ones, instead of being creamy white with pale green "seeds" (drupeoles), were conspicuous for their brownish hue, with the "seeds" themselves brown. Those of larger growth still presented the same features and were also dull instead of bright, with the surface more or less mottled with brown or gray. In both cases, again, they usually rotted without ripening, and showed a growth of some mould fungus upon them. Oftentimes when fruit was formed it presented an irregular, many-lobed form. In addition to these features there might be an unusual number of dead leaves present even about the centre of growth, and the older ones might exhibit patches and blotches of dead tissue to a greater extent than ordinarily is the case. In fact, this degeneration might have proceeded to the extent of producing a small and stunted sickly plant from one of large size and vigorous habit.

Cause.—This pronounced injury was found to be produced by small insects representing the family of the "Thrips" (*Thysanoptera*). More than one kind possibly contributed towards it, but the principal damage

was evidently occasioned by a very small kind, measuring about 6 millimetres in length; although, of other species represented, one that was about 1 mm. (1/24th in.) long was fairly prevalent also. These insects occurred both winged and wingless, according to their age, and were very active, hopping away or flying when disturbed. At the time when the affected area was visited, and that succeeded two days of more or less continuous rain, the insects were principally met with in the flowers, although some occurred on the fruit surfaces.

These examples of thrips effect the damage remarked in the following manner. With their mounth organs, that are of a very peculiar character, they prick in feeding the surfaces on which they occur; and, moreover, with two saw-like organs forming part of their remarkable ovipositor they make minute slits into the living tissue, into which to place their peculiarly formed, relatively large red eggs. Viewing the matter more closely, the following injuries are thus occasioned. As soon as the flowers will admit the insects into their interior, we find them present therein. Here they bite the somewhat thick filament of the stamens, producing in them red specks throughout their lengths, then the anthers themselves. At the same time they attack the pistils and stigmas, causing the premature death and darkening of both. So also they prick the carpels and receptacles on which these are seated. The pistils and carpels soon in many cases become covered with a fungus growth (*Cladosporum* sp., &c.). If growth continues and a fruit is developed (this may be variously distorted as regards form) they continue to injure the carpels and also the surface of the receptacle that intervenes between them. The former become irrorated or clouded with little purple dots, and hence their dark discolouration. The latter —the receptacle (fruit)—also is similarly discoloured in patches; moreover, its skin, not being able to extend as it enlarges, becomes ruptured, widely opened shallow fissures exposing its flesh. The calyx may also exhibit similar discolouration in evidence of its having been injured. Again, the leaf stalk and principal veins of the leaf-blade are densely covered with little deep-red markings also, to which fact their dark colouration that early develops is due. From the surface of the seeds (carpels) a sticky fluid exudes in consequence of the damage received, and this being the site of mould growth their darkened colour becomes more pronounced. Examining the skin (cortex) of the leaf stalks the deep red thrips' eggs are found occurring singly, deeply embedded therein, and, being numerous, they also contribute to the dark colour that it has acquired. Probably the eggs are placed in the tissue of other parts of the plant also. On the surfaces of the affected part we may find the recently hatched thrips, and wingless individuals—larvæ, nymphs, and pupæ—of a greater age; also the winged individuals themselves. Further, the exuviæ or castskins that have been parted with as the different phases of growth have been perfected. The winged individuals are just within the limit of ordinary vision; the wingless ones are either invisibly small or nearly so.

The number of individual insects discernible, never very high on account of their proneness to hop or fly away when disturbed, is always

reduced by rain, and *vice versâ*. In fact, it is during the continuance of dry weather that this pernicious thrips multiplies and becomes so numerous, with corresponding damage as a result.

The female thrips seem to predominate, and although they lay but few eggs apiece, the habits of related species point to a very rapid rate of growth.

Treatment.—As the insect derives its nourishment from the tissues of the plant and from beneath the surface, it cannot be killed by an ordinary poison. Again, no application that will render marketable fruit distasteful is admissible. The very smallness of the insects, their active habits, and their feathered wings (*Thysanoptera*) render it obligatory that whatever be employed be administered in the form of the finest spray. Sulphur (flowers), that will kill many diminutive insects, apparently fails to destroy them. If we could constantly irrigate the plants from above, using water only, such action would greatly reduce their numbers. It would be better, however, to adopt Quaintance's advice to spray the plants from time to time with a decoction of tobacco, to which a little crude molasses had been added; in making it, 1 lb. of stems (waste tobacco) being boiled to two gallons of water, and the infusion reduced by addition of water to make four gallons. Where the proprietary insecticide "Roseleaf Insecticide," sold as containing nicotine in definite amount, is obtainable, this may be conveniently substituted for the home-made article, using 1 pint to every 6 gallons.

It must be borne in mind, however, that these preparations must in each case be applied more than once to secure useful results, also that they are not preventives against attacks, so that if plants that are untreated occur near or amongst those that have been sprayed, and they are thrips infested, they will serve as a source of supply, and so the damage experienced be perpetuated. Where these investigations were commenced the intelligent horticulturist had opportunely mowed off and burnt a patch of plants that were being greatly injured, and evidently with some consequent—although not permanent—benefit.

Conclusion.—There are grounds for concluding that this trouble is more or less widespread in Australia, and occasions noteworthy loss in dry seasons, growers being content with the experience that "it comes and goes." Its nature and origin do not appear, however, to have been previously elucidated.

Three different kinds of thrips have been found associated with the strawberry in Europe, but I cannot recall any thrips injury being treated of in any European memoir dealing with the insect enemies of this plant. And although D. Moulton, the most recent American authority on the *Thysanoptera*, does not mention the strawberry as a host plant for any one of its members, nevertheless, A. L. Quaintance has described a species that injures this plant in Florida in a manner somewhat similar to what happens here. However, the *Thrips tritici* that he has dealt with is larger than the Australian insect, and seems to confine its attention principally to the carpels and petals of the flowers. (*c.f.* 1897, Quaintance (A.L.)—"Some Strawberry Insects," *Bull.* 42, *Florida Agr. Exp. Stat.*, pp. 552-564.

Animal Pathology.

A FEW NOTES ON INDIGESTION IN CATTLE.

By A. H. CORY, M.R.C.V.S.

IMPACTION OF THE RUMEN (PAUNCH).

This affection is not so frequent in Queensland as it is in countries where it is necessary to hand-feed cattle for five or six months of the year. In this country, unless cattle are being prepared for show purposes, they are practically always on natural food; consequently, they are not so likely to have the action of their digestive organs deranged. Sometimes, however, it occurs when animals are turned on to green foods, such as lucerne; they then eat too much, fermentation is set up, and the contracting power of the muscles of the rumen is lost, and the food fails to pass on to the omasum and abomasum.

Symptoms.

These vary somewhat according to the length of time the rumen has been impacted. The animal is not anxious to feed, although it may eat a little, but, as the disease progresses, it refuses food altogether. Rumination (chewing the cud) is suspended; at times there are symptoms of colic (gripes), switching the tail, striking at the belly with the hind legs, and grunting. There is very little accumulation of gases, but the rumen appears full, and, if the hand is pressed into the left flank, a depression frequently remains; the flank, in fact, may be termed doughy. The history of the case—such as the food the animal has been eating, the quantity, &c.—is sufficient to tell one the nature of the ailment.

These cases must always be looked upon as serious, more particularly if brought about by excessive quantities of dry food. With green food, more gases generally form, and as these are dispersed the organ regains its tone or muscular contractibility, the animal making a speedy recovery; but only a small amount of food should be given the animal for a few days.

Treatment.

When Due to Green Food.—The animal should be treated on lines similar to those described for "hoven" or "tympanites"—viz., if gases are present, the use of the trocar and canula, and purgatives to clear out the bowels; 1 lb., or even 1½ lb., of Epsom salts can be given mixed in 2 to 4 quarts of water, but it is advisable to add to the salts some 2 or 3 drachms of carbonate of ammonia and 1 oz. of ground ginger. After giving the drench, thoroughly knead the lower part of the left flank. This assists to break up the impacted material, and allows more of the drench fluid to mix with and soften the food. If this drench does not act as required, one composed of raw linseed oil 1 pint, calomel 1 drachm, and carbonate of ammonia 2 drachms, should be carefully and

slowly given. Drenches containing oil should always be given with the greatest care, for if any oil finds its way into the trachea (windpipe) and into the lungs, a pneumonia (inflammation of the lungs) commonly follows, because oil, in this case, is an irritant and cannot, like water, be absorbed by the air cells of the lungs. Stimulants are required frequently, and spirits, beer, &c., can be given with advantage every 4 or 6 hours, or the following powder, mixed in 1 pint of cold water and given as a drench:—

Carbonate of ammonia, 2 drachms.
Nux vomica, 30 grains.
Gentian, 4 drachms.

When the medicinal treatment fails, it may be necessary to open the rumen and remove about two-thirds of its contents. An incision is

PLATE 24.—TUBERCULOUS UDDER OF A COW.

made in the left flank (downwards from the spot where the trocar and canula are inserted for the relief of hoven), large enough to admit the hand; no food must be allowed to fall between the stomach wall and inside part of flank, or inflammation of abdominal cavity lining (peritonitis) or death of the animal will follow. After the required amount of food has been removed, the edges of the stomach walls should be disinfected and sutured with catgut, the edges of the walls being turned inwards; the skin is then sutured, and the wound treated twice daily with some antiseptics, such as carbolic acid 1 part, glycerine 4 parts, water 30 parts. If a qualified veterinary surgeon is available, his services should be sought before this operation is performed, as in many cases it is useless.

"THE RELATION OF TUBERCULOSIS TO THE MILK SUPPLY."

BY W. C. ELLARD, Science Master, Queensland Agricultural College.

Although 1911 was an epoch-making year, inasmuch that the Royal Commission on Tuberculosis presented their final report, the members of the community most interested, that is to say, dairymen in general, have not yet had an opportunity of learning much from it. It may not be out of place, therefore, to present to readers of this Journal a brief summary of the work done, and conclusions arrived at, in relation to the dreaded "white plague."

Tuberculosis, consumption, or phthisis, has been recognised as a scourge for centuries, and, early in the nineteenth century, an investigator named Klencke succeeded in transmitting the disease by placing tuberculous material in a healthy animal. About the year 1870, three independent scientists, Armanni, Cohnheim, and Salomonsen, repeated Klencke's experiments in a more elaborate manner, but even then could not form an opinion of the cause of the disease. It was left to that great scientist Koch, to announce, in 1882, that he had discovered the causal agency to be a bacillus, and that he could transmit the disease by means of pure cultures of the organism. In 1897 he published a further account of his research work, and this, together with a statement made by him in a lecture delivered at the International Congress on Tuberculosis in 1901, raised one of the greatest controversies ever known in the scientific world. Koch made two main statements which were absolutely hostile to the expert opinions of the day. Firstly, he said that the bacillus causing the disease in man is different to that found in animals; and, secondly, that man could not be infected by means of the bovine bacillus. These statements were so alarming that a Royal Commission was at once formed, with power to make thorough investigation into all phases of the disease.

The bacillus tuberculosis is the primary cause of the disease. It is a rod-shaped organism, with rounded ends, which exhibits such marked characteristics upon staining that it has been called "*the*" acid-fast bacillus. Its effects in man and all susceptible animals are so characteristic that an examination of diseased tissues is sufficient to diagnose the case, even though the bacillus itself be invisible.

Tuberculosis is by far the commonest disease of man, and, though often contracted in infancy, it seldom manifests itself before the fifth year. From the fifth to the eighteenth year seems to be the most susceptible period. The commonest type of the disease is the infection of the lungs, but the joints, bones, glands, abdominal organs, and the peritoneum are also liable to infection.

In addition to man, the disease is found in cattle, pigs, horses, sheep, goats, rabbits, guinea pigs, chimpanzees, monkeys, fowls (and (fish(?)). This is an exceptionally wide zoological range, and dissemination of the disease is a comparatively easy matter. The obvious question at once presents itself: Is the disease found in these animals and human tuberculosis intercommunicable? From the meagre information yet to hand it is impossible to go deeply into the Commissioners' experiments.

Suffice to say that they have pointed out that the bacillus taken from cattle (known as the bovine type) produces a fatal lesion in cattle, pigs, rabbits, guinea pigs, chimpanzees, monkeys, and goats, whereas the human type—*i.e.*, the bacillus found in man—produced a fatal lesion in guinea pigs, chimpanzees, and monkeys; but caused, even when administered in large and progressive doses, only slight and non-progressive lesions in cattle, pigs, and goats. The effects on rabbits were not uniform, some cases being fatal, whilst others were only slightly affected. In artificial culture the bovine type grows less rapidly and less luxuriantly than the human, but is much more virulent in experimental inoculation. These, and other experiments, caused the Commissioners to declare that there are undoubtedly two distinct types of bacilli, one being found common to man and the other to cattle.

Is it possible, then, for man and cattle to be reciprocally infected? This is a most difficult question to answer. It is easy enough to inoculate cattle with the human type and watch results; but it is only in cases of accidental infection that the effects of the bovine bacillus in man can be seen. It almost stands to reason that the part of man's anatomy most exposed to accidental inoculation is the gastro-intestinal tract, and accordingly the Commissioners collected as many cases of disease in these organs as possible. In all, they examined thirty-eight cases where the primary lesions were caused through the ingestion of the bacillus with food. Of these, twenty-nine had lesions in the abdominal alimentary organs, fourteen being due to the bovine bacillus, thirteen to the human, and two showing evidence of the presence of both types. In the remaining nine cases the disease was manifested in the glands of the neck, and six of these were due to the human bacillus and three to the bovine type. When the bacillus is ingested with the food, then, 45 per cent. of the cases are due to the bovine organism. On the other hand, of forty-nine cases of tuberculosis of the lungs examined, forty-seven were due to the human type and two to the bovine bacillus. This holds good in all other parts of the body, the only danger of infection through the bovine bacillus being through the food. This led the Commission to state that from 4 to 6 per cent. of the tuberculosis from which humanity suffers is due to the cow. These figures may appear small at first sight, but when one considers the number of infants and invalids dependent on milk for their food, one can readily see why the Commission headed their report, "Death in the Milkcan!" At the same time, it will be noticed that after maturity is reached the danger of infection is lessened.

The avian type of bacillus does not cause a lesion in man. The bacillus found in fishes resembles the bacillus tuberculosis only in so far as staining is concerned. It is a known fact that milk drawn from a cow with a tuberculous udder almost invariably contains the specific bacilli; but of all cattle infected with the disease, only from 1 to 3 per cent. have the udder affected. All tuberculous cattle are dangerous, however, inasmuch as the milk may become contaminated with bacilli from the droppings and uterine discharges; and whilst these may not be dangerous to the healthy adult, they are decidedly inimical to the adolescent and infant.

Many lessons can be found in the Commissioners' report, but the outstanding feature is that more care should be exercised in controlling milk supplies. All animals found to have the disease should be destroyed immediately. The test for tuberculosis by means of inoculation is inexpensive and practically infallible. The old objections put forward that inoculation caused the disease are absolutely ridiculous, and are not entertained by any enlightened member of the community. Finally, an old theory upset by this report is that goats are not susceptible to tuberculosis. As has been shown, they are liable to contract the bovine type, which is the bacillus of most concern to dairymen. The various methods of combating tuberculosis, and the scientific methods adopted to produce a clean milk supply, unfortunately cannot be dealt with in this article; but enough has been said to cause every right-thinking man to do his utmost to eradicate this fearful plague; and this can only be done by keeping the herd free from the disease.

HOW TO MAKE AN ASPARAGUS BED.

As asparagus is a permanent crop it is worth taking reasonable trouble to thoroughly prepare the bed. The amount of preparation necessary will to a large extent depend upon the natural soil. Long narrow beds are preferable, so that the cutting can be done from each side, without disturbance of the roots. The beds should be kept low because the yearly dressing will tend to build it up. Four-foot beds taking three rows are a handy width, or two rows may be planted in a three-foot bed. If the shape of the ground at one's disposal makes it desirable to have beds side by side, the whole area, including the 18-in. dividing paths should be prepared. This will give extra feeding room for the roots. To prepare the bed, take out the soil the depth of 18 in., keeping the top spit apart; if the subsoil is very poor it is advisable to wheel it away, and replace it by better. The ground should be thoroughly turned over to the depth of quite 3 ft.

Some authorities advocate another foot, but this is going to unnecessary trouble and expense. Having thoroughly broken up the bottom soil, removing any which is best away, any garden refuse, scrapings from the wood heap, bones, old boots, &c., can be dug in. Any long manure available, and a liberal dressing of bone-dust, say 2 lb. to the square yard, should be worked at the same time. Having prepared the bottom and trodden it fairly firm, old decayed manure and the best of the top soil, should be placed on the bed in alternate layers, and forked over. Continue this until the bed is somewhat higher than the surrounding ground. If left for a few weeks it will sink a good deal. During this time the surface should be turned over two or three times so that the soil will be mellow and warm when the roots are placed in it.—"Garden and Field."

General Notes.

FORMALIN AND HOUSE FLIES.

By E. ERNEST GREEN, Government Entomologist.

(From the "Tropical Agriculturist," Ceylon.)

The use of formaldehyde (or formalin), as a deterrent against house flies, has been recommended—from time to time—for some years. The simple exposure of dishes containing dilute formalin was said to drive away every house fly from the premises, and the success of this treatment has been vouched for by various persons. I must confess, however, that my own experiments with dilute formalin have been uniformly disappointing. Whether our Ceylon house fly is a more hardy race, or whether our warmer climate has a weakening effect upon the action of formalin, the fact remains that I have never been able to record the slightest success with this simple treatment.

But if the house fly can be induced to swallow even a weak dose of formalin, it is certainly fatal to that insect. It does not find plain formalin and water sufficiently attractive; but formalin mixed with sugar or milk, in judicious proportion, is readily imbibed by flies—with fatal results. One method is to fill a soup plate with damp sand, place a disc of blotting paper on the sand, spread the paper with sugar, and sprinkle the sugar with dilute formalin—in the proportion of one part to twenty of water. As commercial formalin is of the strength of only 40 per cent., this dilution represents a mixture of about 2 per cent.

The *Journal of Economic Entomology* for October, 1911 (Vol. 4, No. 5) publishes an article on "Formalin for Poisoning House Flies," by R. I. Smith, of the North Carolina Experiment Station. Mr. Smith set himself the task of freeing a college dairy from a plague of flies. Of the condition of affairs before the treatment he remarks:—"In the milk room the flies covered the walls and ceiling, and the straining-cloth at milking time was actually black with flies." He continues:—"My first experiment proved successful. This was the addition of 1 oz. of 40 per cent. formalin to 16 oz. of fresh milk. This mixture was placed in four shallow tin plates and set on the floor of the milk room about 3 o'clock one afternoon. The flies commenced to feed and die within a few minutes, and continued to die rapidly even while the evening's milk was being brought in and strained. These plates of poison were left over night, and the milkers advised me that the flies were feeding greedily the next morning soon after daylight. The dead flies, swept up about 8 a.m., measured about one pint, representing full 5,000 flies.

"This experiment was repeated for three successive days, and about one pint of dead flies were swept up every morning. In addition to the flies actually secured, many dropped dead outside the windows.

"My next experiment was to use a mixture of half milk and half water instead of whole milk. Formalin was added in the same proportion, 1 oz. to 16 oz. of diluted milk. This proved to attract the flies as well as the whole milk.

"Several variations in the proportion of formalin and milk were tested, but my conclusion is that the use of 1 oz. to 16 is most effective. The following method of stating the formula has been used for newspaper articles, in order that every housekeeper can prepare it easily:—1 oz. (two tablespoonfuls) of 40 per cent. formalin; 16 oz. (1 pint) of equal parts milk and water. This mixture should be exposed in shallow plates, and by putting a piece of bread in the middle of each plate, it furnishes more space for the flies to alight and feed, and in that way serves to attract a greater number of them. Whole milk can be used, but the diluted milk seems to be just as successful.

"A very conclusive test of the efficiency of the above formalin mixture was made in a large calf barn where flies were extremely numerous. Six plates of the mixture were placed in the passage way between the stalls. This passage way is about 6 ft. wide and 30 ft. long. The poison mixture was exposed at 12 o'clock noon, and left until 8 o'clock the next morning. The dead flies when swept up measured three quarts, and certainly one-half as many died in the stalls on each side. I estimated that we killed between forty and fifty thousand flies in twenty hours by this experiment.

"At the writer's suggestion many housekeepers have used the formalin as recommended above, and several have reported the killing of flies by the pint and quart. A gentleman in charge of a farm, where a large horse barn is maintained, tells me that he poisoned a gallon of flies the first day he tried the mixture. This statement was vouched for by other witnesses in whom I have perfect confidence.

"A good place to expose the formalin mixture is on the front and back porches, where flies are frequently numerous, and waiting to enter when the doors are opened. I know of several people who have used it successfully in this manner.

"The use of the formalin-milk mixture in dwelling houses has not proved so successful, except in unscreened kitchens of dining-rooms.

"This poison was tested in the large College mess-hall—where over four hundred students can be seated, resulting in practically cleaning up all the flies in two days. Previous to that time the steward had been using tanglefoot fly paper, often having as many as thirty sheets exposed. Fully that number were present when the formalin was used, but in spite of them the flies were numerous."

I have satisfied myself, by actual experiment, that our Ceylon fly is not proof against this mixture. Sweetened condensed milk was employed in place of fresh milk, and proved to be very attractive. Flies that fed upon this mixture died very quickly—certainly within two minutes.

Though so rapidly fatal to house flies, formalin mixed with syrup was eaten by various kinds of ants with impunity. Ants that had partaken freely of poisoned syrup were still alive and apparently in good health after twenty-four hours.

In recommending this treatment, I wish it to be clearly understood that it should only be accessory to measures of strict cleanliness. Flies breed in filth, and where filth is allowed to remain, fresh broods of flies will constantly replace the victims of the poison. The formalin treatment is merely a palliative to destroy existing flies in a building.

OLD CARNATION PLANTS.

"Garden and Field" says that old carnation plants, three or more years old, may be renovated in the following manner:—Dig out the whole plant, injuring the roots as little as possible; manure the spot where it was growing by digging in cow or sheep manure, and then replant 2 in. or so deeper than it was in the first place, spreading out the branches and covering them with soil. Then give a good watering. Each of the branches will then form new roots, and you will practically have as many young plants as the bush has branches. The same end may be gained by simply spreading 2 or 3 in. of fresh soil over the crown of the carnation and keeping it damp by judicious watering, but the first plan suggested is the better, as it enables you to manure the soil beneath the plant.

A MECHANICAL CORN PICKER.

We were shown last July a most ingenious and, as we are informed, a most effective machine which completely obviates the necessity for hand-picking corn in the field. It has been placed on the market by the International Harvester Company, and can be purchased for £75. It is claimed for this machine that it will do the work of six men in picking maize. As was explained to us by the manager of the company, the machine, drawn by four horses, passes along each row of corn, carrying away the whole stalk, which passes up a kind of open shoot. On reaching the top it is met by two rollers, which detach the cobs, the stalk falling through an elongated opening in the bottom of the shoot. The machine is in regular use in the United States of America, where, as is well known, machinery, wherever possible, is made to take the place of hand labour.

ARTIFICIAL RUBBER.

It is stated that Professor Perkit, of Manchester, has discovered a method of producing artificial rubber at a cost of 2s. 6d. per lb. Several scientific men have, during the past few years, made similar discoveries. How is it then that rubber still keeps up to 4s. and 5s. per lb.? It took over twenty years to find out that synthetic indigo could be produced at small cost. There is, therefore, no room for the sceptic to doubt that synthetic rubber may not some day become a commercial product. But, meanwhile, we would not advise a cessation of the extension of rubber plantations.

HANDLING HEAVY PIPE TOBACCOS.

There are several causes why the pipe tobaccos grown in Queensland have not the desirable qualities of the best American, and some of them are chargeable to the manner of handling after the crop is grown. Many farmers seem to think that the period of careful management is over when the harvest time has come, when really it is the time for greatest care and intelligent work. Open sheds are not the best; the tobacco is thus exposed to all sorts of weather, and conditions cannot be controlled; it curves unevenly and irregularly, producing many sorts in the one shed. The tobacco should not be crowded in the shed or on the sticks, as it cannot get ventilation, and cures green, and consequently bad flavour, and if the weather be hot it is liable to scald and become dead and worthless. Tobacco has not finished its cure as soon as dried out; it still retains objectionable matter that must be either modified or eliminated altogether, and this is accomplished by continued hanging.

Heavy tobaccos put into the bulk as soon as dried do not have the aroma that is in those that have been hung for two or three months longer. It may be stripped and put into hands, but should be re-hung to finish the cure; in fact, it is preferred that it should be stripped soon after it has dried.

In stripping, the green or greenish should be put in hands to itself, and they should be small, not more than twelve or fourteen leaves each, and hung where light and air can get to it; if the hands are large, the leaves in the centre will not bleach out, but remain green. It is best to tie all of the tobacco in small hands, as it will continue the cure more uniformly, can be ordered more regularly, and handled more neatly.

Assorting should be carefully done, that the tobacco may have a uniform appearance, care being taken to put nothing with the best grade, or No. 1, that does not belong there; carelessness in this often causes a lower figure to be paid for it, and *sometimes gives trouble with the purchaser, when he has to reassort it.* Every hand should be tied with a leaf of the same colour as the tobacco in that hand, not necessarily a good leaf, but the hand should be, and look, uniform. Please the eye and you please the purchaser, and the grower that establishes a reputation for neat and proper handling of his crop always gets top prices, for all the buyers want his tobacco, as it gives them no trouble.

Before bulking, it should be thoroughly dried out in the heads, and bulked as it comes into condition, and not when it is drying out, for then the stem may be surcharged with moisture that will be taken up by the leaf, and the whole get too soft and funk.

The proper condition for bulking is when it is just pliable and the midrib or stem will snap halfway down the leaf. The proper condition can be determined by taking the tail in the hand and squeezing them together; if they fall apart slowly after removing the pressure, it is right for bulking, but if they stick together it is too soft, and had better be left hanging.

In bulking, the floor should be well off the ground, and so arranged that the dampness arising from the ground cannot penetrate through to the tobacco. The bulks should be large, not less than 8 or 10 feet

wide, and as long as may be convenient; this allows the tobacco to sweat uniformly and continuously, not being disturbed by weather conditions; whereas narrow bulks sweat fitfully, some days lightly, and on other days not at all, owing to the state of the weather. This is important, as tobacco that does not sweat properly does not develop desirable qualities. The bulk should be well covered at sides and on top.

The bulking should be done about the time summer weather is beginning, that the tobacco may not be chilled when it goes in the bulk, and the weather conditions can be depended on for favourable results.

It should remain in bulk four to six weeks before prizing. It must be borne in mind that the sweating of these tobaccos is an entirely different process to the sweating of cigar leaf.

NOTE.—The above directions for curing will not do for cigar tobacco.

Answers to Correspondents.

FEEDING CALVES.

"CALF FEED," Mullett Creek—

Mr. E. Graham, Dairy Expert, replies to your question as follows:—

Sunlight cocoanut oilcake is probably better than linseed meal or linseed jelly, while pollard is also a good adjunct to skim milk for calf feeding purposes. The method of preparing the oilcake is to break it into fairly small pieces, then place the pieces in a vessel and pour a small quantity of boiling water over them; immediately cover over with a bag and allow the oilcake to steam. It will be noticed that the oilcake disintegrates, and swells considerably after the absorption of the added moisture. About a cupful of the treated oilcake should be added to the ordinary skim milk ration. The quantity of oilcake may be slightly increased as the age of the calf advances.

RHODES GRASS.

In reply to a correspondent *re* Rhodes Grass, Mr. G. B. Brooks, Instructor in Agriculture, says:—

Rhodes grass should be planted after all danger of frost is over, at the rate of 2 lb. of seed per acre.

In scrub land it should be sown in the ashes immediately after burning off. On land that has been cultivated, sow and simply roll it in.

Rhodes is undoubtedy the best introduced grazing grass we have, but stock should be kept off until it has got a good hold, which will, in most cases, take some four to five months.

HAYSTACK AND FOUNDATION.

"ALFALFA," Allora—

The height of the stack would depend, to some extent, upon the amount of moisture contained in the lucerne hay. Given an average sample of hay, the height would, with the dimensions given, be approximately 30 ft. Asphalt would certainly make a good foundation. A damp-proof foundation can also be constructed by using strong saplings set in blocks or short stumps. A thick layer of brushwood, with a good coating of straw on top, is a fairly good protection from damp, providing a channel has been cut around the stack to drain off the surface water.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR JULY, 1912.

Article.		JULY.
		Prices.
Bacon, Pineapple	lb.	6½d. to 9d.
Bran	ton	£6 15s.
Butter	lb.	1s. to 1s. 2d.
Chaff, Mixed	ton	£3 15s. to £5 15s.
Chaff, Oaten (Victorian)	"	£6 to £7
Chaff, Lucerne	"	£5 to £7 10s.
Chaff, Wheaten	"	£5 to £7
Cheese	lb.	5¼d. to 7¼d.
Flour	ton	£10
Hay, Oaten (Victorian)	"	£9
Hay, Lucerne	"	£3 to £4 10s.
Honey	lb.	2d. to 2½d.
Maize	bush.	4s. 11d. to 5s. 1d.
Oats	"	4s. 6d.
Pollard	ton	£6 15s.
Potatoes	"	£10 to £13
Potatoes, Sweet	cwt.	5s. to 6s.
Pumpkins	ton	£2 15s. to £3 5s.
Wheat, Milling	bush.	5s. 1d. to 5s. 4d.
Onions	ton	£14 10s.
Hams	lb.	1s. 1½d.
Eggs	doz.	1s. 4d. to 1s. 7d.
Fowls	pair	3s. to 6s.
Geese	"	7s. 6d.
Ducks, English	"	3s. 9d. to 4s. 6d.
Ducks, Muscovy	"	4s. 6d. to 5s. 9d.
Turkeys (Hens)	"	7s. 6d. to 8s. 2d.
Turkeys (Gobblers)	"	13s. to 18s.

SOUTHERN FRUIT MARKETS.

Apples (Choice), per case	4s. 6d. to 9s.
Apples (Cooking), per case	3s. 6d. to 6s.
Bananas (Fiji), G.M., per bunch	8s. to 9s.
Bananas (Fiji), G.M., per case	16s. 6d. to 18s.
Bananas (Queensland), per bunch	1s. 6d. to 6s.
Bananas (Queensland) per case	14s. to 16s.
Cocoanuts, per dozen	2s. 6d. to 4s.
Lemons (local), per gin case	4s. to 5s.
Mandarins (Emperors), per case	4s. to 6s.
Oranges (Navels), per gin case	7s. to 15s.
Other Oranges, per gin case	3s. to 7s.
Papaw Apples, per quarter-case	2s. to 3s.
Passion Fruit, per half-case	3s. to 6s.
Peanuts, per lb.	5½d.
Pears, per bushel case	10s. to 16s.
Pineapples (Queensland), common, per case	6s. to 7s.
Pineapples (Queensland), Ripley's, per case	6s. to 7s.
Pineapples (Queensland), Queen's, per case	6s. 6d. to 7s.
Quinces, per gin case	4s. to 5s. 6d.
Tomatoes, per half-bushel case	3s. 6d. to 4s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Article.	JULY. Prices.
Apples (Eating), per case ...	6s 6d. to 9s.
Apples (Cooking), per case	7s. 6d. to 9s. 6d.
Apricots, per case ...	
Bananas (Cavendish), per dozen ...	3d. to 3½d.
Bananas (Sugar), per dozen	2d. to 2½d.
Cape Gooseberries, per case	5s. to 6s. 6d.
Cherries, per quarter-case	...
Citrons, per cwt.	12s.
Custard Apples, per quarter-case...	5s. 6d. to 7s. 6d.
Grapes, per lb.	...
Lemons (Italian), per case	...
Lemons, per case	5s. to 6s.
Mandarins, per case	5s. to 8s.
Mangoes, per case ...	...
Nectarines, per quarter-case	...
Oranges (Navel), per case ...	6s. 6d. to 9s 6d.
Oranges (Other), per case ...	3s. 6d. to 5s. 6d.
Papaw Apples, per quarter-case	1s 6d. to 1s. 9d.
Passion Fruit, per quarter-case	4s. to 6s.
Peaches, per quarter-case ...	
Peanuts, per lb.	3½d.
Pears, per case	...
Persimmons, per half-case...	...
Plums, per quarter-case	...
Pineapples (Ripley), per dozen	1s. 9d. to 3s.
Pineapples (Rough), per dozen	1s. 6d. to 3s.
Pineapples (Smooth), per dozen	3s. 6d. to 4s. 6d.
Rockmelons, per dozen	...
Rosellas, per quarter-case ...	1s. 6d. to 3s.
Strawberries, per tray	1s. 9d. to 3s.
Tomatoes, per quarter-case	1s. to 4s.
Watermelons, per dozen ...	...

TOP PRICES, ENOGGERA YARDS, JUNE, 1912.

Animal.	JUNE. Prices.
Bullocks	£7 17s. 6d. to £8 7s. 6d.
Cows ...	£5 7s. 6d. to £6 10s.
Merino Wethers	19s. 9d.
Crossbred Wethers...	23s. 9d.
Merino Ewes	15s. 6d.
Crossbred Ewes	19s.
Lincoln Ewes	20s. 9d.
Lambs	16s. 3d.
Pigs (Baconers)	...
Pigs (Porkers)	...

Farm and Garden Notes for September.

FIELD.—Spring has now arrived, and with it there will be the usual trouble with weeds, especially on carelessly cultivated, uncleaned ground. Therefore, the cultivator and the horse and hand hoe must be kept vigorously at work to check the weed pests and save the growing crops and much future labour. Attend to earthing up any crops which may require it. There may possibly occur drying winds and dry weather; still, good showers may be looked for in October, and much useful work may be done during the present month which will afford a fair prospect of a good return for labour.

Plant out *Agave rigida, var. sisalana* (sisal hemp plant) in rows 9 ft. by 9 ft., 8 ft. by 8 ft., or 6 ft. by 8 ft. apart, according to the richness of the soil. All dry places on the farm, too rocky or poor for ordinary crops, should be planted with this valuable aloe; especially should limestone country be selected for the purpose. If the soil is very poor and the plants very small, it is better to put the latter out into a nursery of good soil, about 1 ft. to 18 in. apart. Next year they will be good-sized plants. Keep down tall weeds in the plantation, and do not allow couch grass to grow round the roots. The sisal will do no good if planted in low, wet land, or on a purely sandy soil. It thrives best where there is plenty of lime, potash, and phosphoric acid, all of which can be cheaply supplied if wanting in the soil. Sow cotton—Sea Island—near the coast, and Upland generally; Caravonica succeeds best in Northern Queensland. Sow maize, sorghum, imphee, Mazzagua, prairie grass, panicum, tobacco, and pumpkins. Sugar-cane planting should be vigorously carried on. Plant sweet potatoes, yams, peanuts, arrowroot, turmeric, chicory, ginger, and canaigre—the latter a bulb yielding a valuable tanning substance. Plant out coffee.

KITCHEN GARDEN.—Now is the time the kitchen garden will richly repay all the labour bestowed upon it, for it is the month for sowing most kinds of vegetables. If the soil is not naturally rich, make it so by a liberal application of stable manure and compost; dig or plough the ground deeply, and afterwards keep the surface in good tilth about the crops. Water early in the morning or late in the evening, and stir the soil in the latter case early next day to prevent caking. Mulching with straw or leaves or litter will be of great benefit as the season gets hotter. It is a good thing to apply a little salt to newly dug beds. It is not exactly known what the action of salt is on the soil, but when it is applied as a top-dressing it tends to check rank growth. A little is excellent for cabbages, but too much renders the soil sterile, and causes hard-pan to form. French or kidney beans may now be sown in all parts of the State. The Lima bean delights in the hottest weather. Sow the dwarf kinds in drills 3 ft. apart and 18 in. between the plants, and the climbing sorts 6 ft. each way. Sow cucumbers, melons, marrows, and squashes at once. If they are troubled by the beetle, spray with

Paris green or London purple. In cool districts peas and even some beetroot may be sown. Set out egg-plants in rows 4 ft. apart. Plant out tomatoes 3½ ft. each way, and train them to a single stem either on stakes, trellis, or wire netting. Plant out rosellas. Sow mustard and cress, spinach, lettuce, vegetable marrows, custard marrows, parsnips, carrots, eschalots, cabbage, radishes, kohl-rabi, &c. These will all prove satisfactory provided the ground is well worked, kept clean, and that water, manure, and where required shade are provided.

Flower Garden.—Continue to plant bulbs as directed last month. Protect the plants as much as possible from cold westerly winds, which may still occur, notwithstanding the increasing temperature, and see that the bulbs do not come in contact with fresh manure. Keep a good lookout for slugs. Plant out chrysanthemums, palms, and all kinds of tropical and semi-tropical plants. If hot weather should ensue after planting, water and shade must be given. Sow dianthus, snapdragon, coleus. Roses will now be in full bloom. Keep them free from aphis, and cut off all spent blooms. This latter work should be done in the case of all flowers. If you wish to save seeds, do not wait for the very last blooms, but allow some of the very best to go to seed. If you have any toads in the garden or bush-house, encourage them to take up their abode there. They are perfectly harmless in spite of their ugliness, and they destroy an astonishing number of insects injurious to plants. Fill up all vacancies with herbaceous plants. Sow zinnia, gaillardia, amaranthus, cockscomb, balsam, sunflower, marigold, cosmos, summer chrysanthemum, coreopsis, portulacca, mesembryanthemum, calendula, &c.

Orchard Notes for September.

THE SOUTHERN COAST DISTRICTS.

The marketing of citrus fruits, in the later districts, of the late winter or early spring crop of pines and bananas, also of strawberries and Cape gooseberries, will continue to occupy the attention of fruit-growers. I can only repeat the advice I have so often given in these Notes respecting the marketing of all kinds of fruit—viz., to grade the fruit evenly, pack honestly, and display it to the best advantage if you want to get good returns.

September is a very important month to the fruit-grower, owing to the fact that it is usually a dry month, and that it is essential in all cases to keep the land in a high state of tilth, so as to retain the moisture that is required by the various trees that are in blossom, thus securing a good set of fruit. Where irrigation is available, it is advisable to give the trees a good watering should the ground be dry, as this will induce a good growth and cause the fruit to set well. If an irrigation is given, it should be a thorough one, not a mere surface watering, and once the

land is saturated the moisture must be retained in the soil by constant and systematic cultivation. If this is done, one good watering will usually be enough to carry the trees through in good condition to the thunderstorms that come later or even to the summer rains, if the soil is of a deep sandy loamy nature.

No weeds must be allowed in the orchard or vineyard at this time of the year, as they are robbing the trees and plants of both the water and plant food that are so essential to them at this period of their growth.

There is not much to be done in the way of fighting scale insects during the month, as they are more effectually dealt with later on; but where young trees are showing signs of distress, owing to the presence of scale insects, they should be treated, the gas method being the most efficacious.

Beetles and other leaf-eating insects often make their appearance during the month. The best remedy is to spray the trees or plants with one or other of the arsenical washes that are recommended by me in this journal. The vineyard will require considerable attention. Not only must it be kept well worked, but any vines that are subject to the attack of black spot must be sprayed from time to time with Bordeaux mixture. Disbudding must be carefully carried out, as this work is equally as important as the winter pruning, as it is the best means of controlling the future shape of the vine. A very common fault with vines grown in the coast districts is that the buds often remain dormant, only the terminal bud and possibly one other starting into growth, thus leaving a long bare space on the main rods, which is undesirable. When this takes place, pinch back those shoots that have started, and which are taking the whole of the sap, and force the sap into the dormant buds, thus starting them into growth. This will result in an even growth of wood all over the vine—not a huge cane in one part and either a stunted growth or dormant buds on the rest.

Every care should be taken during the month to prevent the fruit fly from getting an early start. All infested oranges, loquats, kumquats, or other fruits should be gathered and destroyed, as the keeping in check of the early spring crop of flies, when there are only comparatively few to deal with, will materially lessen the subsequent crops. Land that is to be planted to pines or bananas should be got ready now, though the planting need not be done till October, November, or even later. Prepare the land thoroughly; don't scratch the surface to the depth of a few inches, but plough as deeply as you have good surface soil, and break up the subsoil as deeply as you can possibly get power to do it. You will find that the extra money expended will be a profitable investment, as it will pay every time.

THE TROPICAL COAST DISTRICTS.

September is usually a very dry month, and fruit trees of all kinds suffer in consequence. The spring crop of citrus fruits should be harvested by the end of the month, as, if allowed to hang later, there

is a great risk of loss by fly. The fruit should be well sweated; and, if carefully selected, well-graded, and well packed, it should carry well to, and fetch high prices in, the Southern States, as there are no oranges or mandarins grown in Australia that can excel the flavour of the best of the Bowen, Cardwell, Cairns, Port Douglas, or Cooktown fruit.

As soon as the fruit is gathered, the trees should be pruned and sprayed with the lime and sulphur wash, as this wash is not only a good insecticide, but it will keep down the growth of all lichens, mosses, &c., to which the trees are very subject.

Every care should be taken to keep down the crop of fruit-fly during the month. All infested fruit should be gathered and destroyed, particularly that in or adjacent to banana plantations. Watch the banana gardens carefully, and keep well cultivated. New land should be got ready for planting, and where land is ready planting can take place.

Papaws and granadillas are in good condition now, and, if carefully gathered and well packed in cases only holding one layer of fruit, they should carry well to the Southern markets if sent in the cool chamber.

THE SOUTHERN AND CENTRAL TABLELANDS.

Prune grape vines at Stanthorpe in the early part of the month, leaving the pruning as late as possible, as the object is to keep the vines back in order to escape damage from late spring frosts. All vines subject to the attack of black spot should be treated with the winter dressing when the buds are swelling; this treatment to be followed by spraying with Bordeaux mixture later on.

Where fruit trees have not received their winter spraying, they should be treated at once before they come out into flower or young growth. Where the orchard or vineyard has not been ploughed, do so, taking care to work the land down fine as soon as it is ploughed, so as to keep the moisture in the soil, as the spring is always the trying time for fruit trees.

Look out for fruit-fly in the late oranges and loquats in the Toowoomba district. Keep the orchards and vineyards well cultivated; disbud the vines when sufficiently advanced. Spray for codlin moth.

In the Central tablelands irrigate vines and fruit trees, and follow the irrigation with deep, constant, and systematic cultivation. Keep down all weed growth, and fight the red scale on citrus trees with cyanide. The objective of the fruit-growers throughout Queensland during September and the two following months is, "How best to keep the moisture in the soil that is required by the trees, vines, plants, and vegetables"; and this objective can only be obtained by irrigation where same is available, or by deep, systematic, and constant cultivation where there is no water available for irrigation.

QUEENSLAND AGRICULTURAL JOURNAL

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Agriculture.

LUCERNE.

The following valuable paper on the subject of lucerne-growing was read by Mr. Primrose McConnell, manager Ruakura Farm of Instruction, at a conference held under the auspices of the National Dairy Association of New Zealand, Ltd., and the Factory Managers' Association of New Zealand, in connection with the Waikato Winter Show, in the Oddfellows' Hall, Hamilton, 6th June, 1912 :—

I think you will agree with me that we farmers are still learning the "A.B C" of agricultural economics; and, as a matter of fact, the conditions generally obtaining in a new country are such as to discourage the desire for knowledge in this direction. In all newly settled countries, land speculation is the great obstacle to everything progressive in agriculture, and its dire effects are so far-reaching that few of us realise the extent of the evil until it is too late. Much of the indifferent farming in New Zealand is undoubtedly due to the fact that land is regarded more as an article to be bought and sold than as a medium for the growth of produce or stock. Under these conditions, many of the rules we apply are suitable only for the present; many others are not even suitable for that, and we are often reluctant to look ahead, to see what may eventuate in future years by the present application of such rules.

In no other profession under the sun has an applied rule such far-reaching effect—good or bad—as in the profession of farming. Let a farmer make a mistake in any way connected with the cultivation of the

soil or the growing of crops; that mistake cannot be recalled, and may cast a detrimental effect for years to come. Now, I do not pretend that there is such a prodigy as a farmer who makes no mistakes. I have made many myself, and, if I live, in all likelihood will make many more; it has been truly said that a man who has never made any mistakes never made anything; but is it not a fact, gentlemen, that we farmers are too conservative? We are prone to look askance at new ideas; not only so, but we are too ready to single out the weak points of those ideas and pass over the good points that we might seize and apply with the best results. Many of us are adopting the attitude of Micawber; we are "waiting for something to turn up." We are living in the expectation of the day when farming will be carried on on the "penny-in-the-slot" principle. Gentlemen, that day has not yet arrived.

We prate glibly of science, and what it is going to do for us, at the same time ignoring well-tried rules, the adoption of which invariably leads to success. Science has done invaluable work for farmers, and will yet do much more; and I would not be worthy of my present position did I in any way attempt to minimise the benefits of science as applied to agriculture. But even the power of present-day science is limited; and more so in connection with certain phases of farming than with any other profession. Many of us are under the impression that science must have some immediate connection with a laboratory, not realising that we may be farming scientifically and, strictly speaking, know nothing whatever of science. For instance, we may be growing lucerne on a large scale, and not be aware of the fact that we are endorsing some of the latest findings of agricultural science. Forty years ago, the best farmers farmed as scientifically—in so far as the tilling of the soil is concerned—as we do to-day, but they were not aware of the fact.

Now, I feel sure you will admit that in cultivating the soil a farmer's main object should be not only to get as much out of it as possible but also to leave as much in it after the harvest as possible, so as to maintain, or even improve, the original fertility. To do this in a country like New Zealand, where farmyard manure is most conspicuous by its absence, is no easy task; but it is not impossible, and in many instances it has become imperative. Improved land has now become so dear that a purchaser of such can only hope to succeed by adopting most modern methods of agriculture. Turning out much produce from a small area is now a necessity, and will become more so as time goes on. Now, the question that each farmer must set himself to answer is: "How can I do this, and maintain or, better still, increase the soil's fertility?"

Of the many ways that lead to this end, I can only deal with one to-day, but, in my opinion, it is a most important one—and that is the growing of lucerne.

Gentlemen, I am convinced that even the most enthusiastic grower of lucerne has not yet realised its enormous possibilities, and I wish to say, at this point, that if the New Zealand Department of Agriculture never does anything except encourage the growing of lucerne, and demonstrates that it can be grown on a practical scale on unlikely soils, that department

more than justifies its existence. I have so much faith in this plant that I believe it will yet revolutionise New Zealand farming, and more particularly dairy farming.

Lucerne belongs to the order of legumes, and is related to the clovers. Its principal characteristics are a long tap root and an upright stem, the latter multiplying under the influence of cutting, and sprouting from a crown just above the ground. The leaves have three leaflets, which are narrower than in clover, but otherwise somewhat similar. The flowers are purple and are borne at the ends of the stems and branches. The seeds are enclosed in spiral pods, and resemble red clover, but are more kidney-shaped, and when perfectly fresh are of a greenish yellow colour, which changes to brown with age. The most striking characteristic of this plant is its long tap root, which may penetrate to a depth of from 20 to 30 ft. No known plant will grow such a succession of heavy crops for years as lucerne, and at the same time increase the soil's fertility; and, certainly, no known plant is of such high value as a fodder for all classes of farm stock.

Red clover, which comes next to lucerne in nutritive value, has only a percentage of 7·52 of crude protein, while lucerne has a percentage of 13·13. Also, the ash in lucerne, which is of high value for young stock, has a percentage of 4·30, while in clover it is only 2·28; in fact, the whole analysis of lucerne is very similar to that of wheat bran.

Given the right variety, no other known forage plant will thrive under such varied climatic conditions. Lucerne thrives in many of the Canadian provinces, where the winters are exceptionally severe, and in nearly all parts of the United States of America. It grows to perfection in the hottest parts of the Argentine; in fact, it has simply been the making of that country.

I might also state that, had it not been for lucerne, the competition in the beef and mutton trade, as far as the Argentine is concerned, would have been about nil, and it is for us to fight the Argentine with its own weapon. Under irrigation it grows on the wretchedly poor soils of Patagonia, and it grows to great perfection in many parts of Australia. In Europe and the South of England the area under lucerne is increasing by leaps and bounds, and even in Scotland this plant has gained a firm footing in localities where the idea of growing it would at one time have been laughed at.

It is not now a question, "Is the soil suitable?" but rather, "Is there any soil—within reasonable limits—that is not more or less suitable?" The difficulties of growing lucerne on many soils, on which the initial trials proved failures, have now been overcome, simply because we now have a greater knowledge of the needs of the plant. No doubt much will be done in the near future by the use of seed from acclimatised plants, and in this direction we are already commencing to make discoveries at the Ruakura Farm of Instruction. Nine varieties of lucerne are under test in our nursery at the present moment. Side by side are growing two plots of the Peruvian variety—one the result of imported seed, and the other the result of seed grown in the nursery. The plants from the home-grown seed are healthy over the whole plot, while those from the imported seed are almost

white with leaf spot. All the varieties are now showing a month's growth, which, in the different varieties, varies from 2 in. to 18 in. in height. This is a great object lesson as to what may be done by choosing the right variety and how much more may be done when we possess seed grown from acclimatised plants of the right variety. Surely we in New Zealand cannot afford to ignore so valuable an asset, seeing that our climate, and much of our soil, are eminently suitable for the cultivation of this crop, and that we are farming under conditions which demand the growing of such crops for reasons I have already stated.

With regard to the value of lucerne as a forage crop, it may be that we are still ignorant of many of its good properties, although those already known are legion. It may be fed successfully to all stock on the farm—horses, cattle, sheep, pigs, and poultry. It may be used in a variety of forms, such as in the green stage for soiling purposes ; as ensilage and as hay, and the latter may be ground and made into an excellent meal, which may be used dry or wet. It has been proved beyond any doubt that a ton of the best class of lucerne hay is equal to a ton of bran. Now, gentlemen, if you will consider the price you are paying for bran, and also how many tons of lucerne hay you can grow to the acre in one year, you will easily convince yourselves that you are simply wasting money wholesale by purchasing bran and neglecting the cultivation of lucerne. It makes an excellent pasture for pigs, and they will thrive on this food alone ; but it should not be grazed closely, and not at all the first season. It is of the greatest value from the fact that, once established, it requires little attention for years. Its deep-rooting habit enables it to resist long periods of drought, and to draw food ingredients from a depth which no other plant can reach ; and it has the marvellous power of producing highly nitrogenous fodder and at the same time leaving the soil rich in nitrogen.

As showing its high value in this direction, I may be excused for quoting from a report of one of the Rothamstead experiments :—" On Hoos field, wheat, after bare fallow, was compared with an adjoining field of lucerne. Neither crop received any nitrogenous manure, and after a period of eight years it was found that one average yearly crop of lucerne contained more than thirteen times as much nitrogen as the average yearly crop of wheat (straw and grain), thus showing the immense superiority of lucerne over a grain crop as a producer of nitrogenous food for stock."

But, more wonderful still, on an analysis being made of the soil from the two plots, it was found that in the top 9 in. of soil the lucerne plot contained 524 lb. more nitrogen per acre than the plot which had been cropped with wheat. This amount of nitrogen is equal to about 30 cwt. of nitrate of soda, worth in New Zealand about £24. This wonderful process of storing atmospheric nitrogen in the root system, by the aid of certain low forms of life, is, as yet, imperfectly understood, but the concrete fact remains nevertheless. Just think of it, gentlemen ; we are spending money in the purchase of nitrogenous manures, when we may have it delivered on our land absolutely free of cost by the growing of lucerne.

But more amazing still : A company has been formed in the United States to place the manufactured products of lucerne on the market. Among

the products will be a syrup which contains as much sugar as cane or maple syrup, and is also of a very fine flavour. The lucerne is cut every twelve days, or about twelve times in the season. Referring to the commercial value of the discovery, an American paper says that, with sugar at 2d. per lb., the lucerne would bring about £5 to £6 per ton. The paper concludes the article by stating that lucerne may become too valuable to use simply as a fodder for stock.

Gentlemen, need I say anything further in order to prove the incalculable value of this plant? And to all the dairy farmers present I would say: "You cannot afford to do without it."

Lucerne has also the valuable property of being able to leave behind an enormous weight per acre of root growth, which decays and forms a supply of humus for following crops; and although it makes a strong demand on such soil constituents as lime, phosphorous, and potash, its deep-rooting habit enables it to draw food supplies from a great depth, and limits considerably the necessity for the surface application of manures.

Authentic recent statistics are not available showing the area of lucerne now under cultivation; but at the end of 1903 Argentina had 4,273,503 acres, in 1905 France had 2,657,923 acres, in 1906 Germany had 594,872 acres, in 1901 European Russia had 130,291 acres, in 1906 Australia had 108,401 acres, in 1905 Belgium had 33,049 acres, in 1907 England had 63,379 acres (being an increase over the previous year of 7,974 acres), in 1907 Wales had 338 acres (an increase of 54 acres over the previous year), in 1907 Scotland had 78 acres (an increase of 33 acres over the previous year). I have not been able to obtain statistics as to the area in the North American States, but it must now be very large. Since the dates mentioned, the areas in the different countries must have increased enormously.

As I have already stated, many of us are apt to look on new introductions with suspicion, and possibly we are, in some instances, justified; but, seeing that lucerne has been cultivated for something over 2,000 years and stood the test of time as no other plant has done, it cannot be looked upon as a novelty. Lucerne is a native of Asia, and was in high favour among the ancient Persians, Greeks, and Romans. It was introduced into Spain by the Moors under the name of alfalfa, and was brought to Mexico by the Spaniards during the invasion. Since the latter time it has spread, more or less, over the whole of America, from North Canada to Terra del Fuego. Perhaps in no country is it so highly prized as in the States of North America, where it is looked upon as the dairyman's cure-all.

(TO BE CONTINUED.)

SELLING A FARM BY INSTALMENTS.

Every crop takes from the soil some of its fertilising elements in the form of plant food which are for ever lost to it, and must be returned every year in order to enable the land to produce the same quantity and quality of its products of the previous year. If the farmer fails to restore to the soil the plant food which the crop has taken out, the producing power of

the soil is gradually diminished, and its value correspondingly decreased, until finally it becomes, if not entirely barren, quite unprofitable and worthless for purposes of cultivation. To restore exhausted soil to its original standard of fertility requires a long, scientific, and expensive course of treatment; and therefore, in exchanging for money the things produced by the sacrifice of the soil's natural fertility, the owner would be selling his farm and receiving pay for it in instalments. Even if he had been frugal, and is in comfortable circumstances when the producing capacity of his land had finally become exhausted, it would probably require the expenditure of all of his means, accumulated by robbing his soil, to restore it to its original condition and value.

The farmer who considers, by means of an occasional fallow and perhaps a season's rest, he can restore to the soil the kind of plant food taken by the heavy crops previously grown upon it is woefully mistaken and densely ignorant of soil chemistry. It would be far better for him to have sold his farm outright in the first instance, and use the money in some other business, than to sell it in instalments amounting in the aggregate to less than he could have sold it for in the beginning.

No matter what the productive capacity of a soil may be, after a crop has been harvested the plant food which the crop has extracted from it, in the process of growth and maturity, should be returned to the soil in the form of manure, lime, potash, available phosphoric acid, nitrogen, &c., in their most concentrated and soluble forms, and in accordance with the best methods known to agricultural science. A man need not be a scholar to be able to do this, if he can read understandingly and shake off "that tired feeling" which comes to his brain when he tries to think.

There is one important service that fertility renders that rarely occurs to the average farmer. He thinks of a rich soil mainly as the means of producing a larger crop. But that is not all of its value. A fertile soil, abundantly stored with all the elements of fertility, is largely valuable in holding up against the vicissitudes of the seasons. For instance, a poor soil will bear a very fair crop in a season of sufficient moisture, but only a rich soil can hold up a crop in a drought. There was a fine old farmer many years ago of whom it was said by his neighbours that he grew abundant crops in all kinds of seasons. Of course his methods were wise; but back of it all lies the fact that he had promoted, not lessened, the fertility of his farm.—"Farm and Home."

CLEARING WITH EXPLOSIVES.

The "Agricultural Gazette" of New South Wales (2nd May) has the following notes, by Mr. H. B. Faviell, Bonville, on the above subject, and it is stated that experiments are to be carried out at the Grafton Experiment Farm as well as at other farms, and at Bonville in conjunction with Mr. Faviell.

THE VALUE OF EXPLOSIVES IN CLEARING.

It will be found that the chief uses to which explosives can be put with economy in clearing land are in the removal of stumps, and in so shattering

logs or standing trees that they burn more readily. Trees can be blown right out of the ground; but, owing to their greater weight, they take more explosive than stumps. I therefore consider it more economical to put sufficient explosive under them to blow the earth out from around the roots, at the same time cracking and breaking the roots and butt of the tree. The cracks will extend from 4 ft. to 15 ft. up the trunk of the tree; and after a week's exposure to the air in dry weather, even bad-burning timber will then burn readily. I have burnt down trees 7 ft. in diameter at the ground in six to twenty-four hours, having used 5s. worth of explosives on some. These trees would have taken a week to burn down in the ordinary way—that is, digging the earth away from them, and drawing timber around them with horses or bullocks.

The economy of the method will be realised when I state that I have cleared 12 acres of land at a cost of £3 per acre, whereas an adjoining block of similar land cost me about £6 per acre to clear in the old way. This was on light red volcanic soil, overlying light clayey loam.

The method cannot be recommended in cases where timber burns right out of the ground, leaving no roots. But in this district I have found the saving in cost to vary from 25 to 50 per cent. on the usual methods of grubbing and burning. With practice, much better work can be done at less cost with explosives. The procedure should be varied to suit different timbers and different soils; the exercise of a little judgment will be found profitable.

Sound timber, whether trees, stumps, or logs, will be shattered with better effect than hollow or rotten timber, as it offers more resistance to the explosives.

CONDITION OF THE SOIL.

To obtain best results I find that the ground requires to be fairly dry. If it is very dry the explosion is not quite so effective, whilst if it is too wet the force seems to act too deeply in the earth, instead of near and above the surface. In some districts, I am informed, best results are obtained when the ground is wet; but that is not my experience, and I do not know to what degree it holds good.

EXPLOSIVES RECOMMENDED.

For firing, a battery *guaranteed* to fire five or more shots is absolutely necessary for best results. It is possible to work in small timber with fuse and caps, but the method is not so satisfactory as the use of a battery.

The explosives which I have used are rackarock and rendrock. I consider the latter the better for earth holes, as it seems to take more roots with the stump; but I can recommend both. I have used a little gelignite, and it seems very good; I intend to give it further trials. Other explosives are worthy of trial, but I should not advise farmers to use dynamite, as it is more subject to chemical changes particularly in hot climates.

If rackarock is used, insert the detonator in half a plug of gelignite for earth holes. Much better combustion will result if this is done.

BURSTING THE TIMBER.

When it is desired to burn trees or stumps level with the ground, or to burn sound logs, bore holes 1 ft. to 2 ft. deep into the soundest part of the timber, with 1 in. to 1¼ in. auger, and charge same with ½ lb. to 1 lb. of explosive. A number of shots fired simultaneously with the battery will do very much better work than when they are fired singly with fuse. This method is suitable for Yankee grubbing, as it uses less explosive, but is not as good as the next method for getting rid of trees and stumps.

CLEARING FOR THE PLOUGH.

To remove trees and stumps for the plough, put holes under the heaviest and soundest parts of same, 12 in. or more in depth, with a 3-in. earth auger or small bar and scraper. When placing the charges, take into consideration the lay of the main spur roots. Best results are obtained by using three charges or more, according to the size of the tree. Place each charge up against a big strong root or, better still, in the fork of two roots. If it is not easy to get the charge against a root, ram small stones into the bottom of the hole, so as to make a sound bottom for the charge, as the more resistance obtained the better the results of the explosion. Do this before any explosive is put in the hole, or there would be great danger.

In some cases it is better to use both earth and wood holes, placing the latter in big spur roots ; but I rarely do so, as it snaps the roots and leaves portion in the ground.

The charges should be carefully tamped with damp clay or earth, observing the proper rules, as there is considerable danger if they are neglected. Water tamping is not at all effective in wood, though it is in rock.

In earth holes I find 1 lb. of explosive about the minimum effective charge for large trees and stumps ; but I have blown out small stumps with as little as ¼ lb. With well-placed charges, stumps frequently come out, shattered into many pieces, leaving few if any roots. When any remain they are so shattered that they burn easily.

A WARNING.

A beginner will require 50 lb. of explosives to give the method a thorough trial. He should start on medium-sized sound stumps, as they are easier to operate on. Necessary care should be observed when handling explosives, and he should be extremely careful of the detonators. He should also bear in mind that large bits of wood will sometimes fly 150 yards. Detonators should never be *stored and kept* with explosives in the same receptacle.

OVERSTOCKING.

When many splendid seasons occur, as has been the case for the past ten years, stockowners, grazing farmers, and dairymen are tempted to put on more stock, particularly sheep, than would be warranted under normal conditions of alternate dropping and dry seasons, and this frequently leads to considerable loss of stock. The question which every stockowner should ask himself is, how many head of cattle or sheep should his station or selection

support. It is possible to understock, and also to overstock, but of these two evils the latter is the most ruinous. And clearly so, for if land is understocked it is easy to rectify this by purchase, and the understocked man has the advantage that he can buy in a probably low market, but it is not easy to relieve overstocked land because, when the bad season comes, and feed is scarce, prices naturally fall, and the grazier must sell to save a remnant; and, at such times, selling means selling at a loss. The American millionaire, Rockefeller, made his millions by buying when mining, railway, or other stock was cheap, and selling on a rise. So with live stock; the time to buy is when sheep and cattle are cheap, and it is then that the understocked man has his opportunity, whilst the overstocked man cannot buy for want of country, nor can he sell to advantage. There is a very excellent article on this subject of overstocking in the "Live Stock Journal" for May, 1912, and it applies just as well to the Australian grazier as it does to the British farmer.

"The overstocked farmer," says that journal "is always beset with anxiety as to the weather, for his pastures are charged to their full capacity, and he is liable to be faced with scarcity of food and falling prices at one and the same time. There is another disadvantage in overstocking, in the form of 'stained' land, which is more likely to be caused by sheep and horses than by cattle, for land can readily be over-sheeped or over-horsed, but is not, apparently, so easily poisoned by horned stock.

"It is true that foods may be purchased to relieve the tension in times of scarcity, but it is expensive; and, unfortunately, feeding-stuffs have a way of going up in price in periods of drought, while the cattle markets are glutted with stores. The class most affected by too large numbers is lean or store cattle, for they are the most difficult to dispose of; and the least affected are fat cattle, as they always command their full value. Newly-calved cows and down-calving heifers are also easily sold to advantage, but old, dry cows and young stock are generally at a great discount. To adjust the amount of stock to the area of land is a vital question, for, after all, success in grazing depends more upon judicious stocking than in solving nice questions as to the comparative values of food or of scientific methods of feeding. Water is a most important adjunct, for with plenty of it stock can be tided over periods of scarcity in a way which often surprises even experienced graziers. This was well shown last summer, and has often caused remark, so that well-watered pastures must be considered as a desideratum. Relief from overstocking may sometimes be obtained by taking keep at a distance, and, on the whole, this is more economical than buying artificial foods. Hay-buying is one of the most extravagant forms of relief. Many of the best farmers are known to maintain heavy stocks; and 'plenty of stock' is often regarded as an indication of prosperity. This is quite true, but, at the same time, it is possible to overstock, and for farmers to place themselves in a quandary in which they find it alike difficult to maintain their animals or to get rid of them is highly undesirable."

All stockowners will remember the disastrous years preceding 1902, when relief country was eagerly sought by overstocked graziers, and when it paid sugar-planters better to sell their cane to farmers in the drought-stricken districts than to crush it for sugar. Even lately, before the bene-

ficent June rains of 1912, sheepowners were glad to send their stock to relief country, and some sold both sheep and dairy stock at exceedingly low prices. in order to sustain life in the remainder. No doubt the numerous bores provide abundance of water, but water alone will not keep stock alive ; and although bore-water drains run for miles through grazing country, the lateral drainage is not sufficient to provide a wide grazing area. Hence, if during a good season a run or grazing farm is stocked up to its full capacity, a drought spells disaster. It therefore behoves graziers to study this important matter carefully, for what does it profit him to get a heavy clip and big lambing one year, when a few months of drought will decimate his flocks ? *verb sap.*

THE CULTIVATION OF MAIZE IN QUEENSLAND.

Maize was for a long time known only as Indian corn, a name which was given to this cereal from its having first been discovered by Europeans when they landed in what is now the State of New York, in the United States of America. It was also found to be indigenous in Mexico, and was one of the staple foods of the South American Indians. As far back as 1535 it was found growing extensively in what is now known as Canada. The "Book of Corn" says that in 1620 the Pilgrim Fathers found quite extensive plantings in New Plymouth and Massachusetts, and at the end of the 15th century Columbus found it in the West Indian Islands. In all these countries maize has never been found in the condition of a wild plant, and the original form of the species has never yet been identified. The French botanist, A. de Candolle, says that "we have nothing but conjectural knowledge. Maize is a plant singularly unprovided with means of dispersion and protection. The grains are hard to detach from the ear, which is itself enveloped. They have no tuft or wings to catch the wind, and when the ear is not gathered by man the grains fall, still fixed in the receptacle, and then rodents and other animals must destroy them in quantities, and all the more that they are not sufficiently hard to pass intact through the digestive organs, although they often do so in the case of the horse. It was consequently probable that its dispersal throughout extensive regions in the Americas was due to wandering tribes of savages, who, having perceived its nutritious qualities, saved it from destruction by cultivating it."

Whether the true origin of Indian corn, one of the most important cereals of the world, will ever be ascertained, is doubtful, but this is a matter of little concern to maize-growers in this State, or in any other part of the world. What has concerned them more particularly, and what concerns them at the present day, is the method of improving the grain by developing the size of the grain, reducing that of the internal core to which the grains art attached, usually called the "cob," and altering the shape of the kernel, all of which changes are effected by seed selection, and this work has given rise to a regular industry under the name of "corn-breeding." It may incidentally be stated that in all American or British maize-raising countries the grain is known generally as "corn." I shall deal with the question of selection and its results later on.

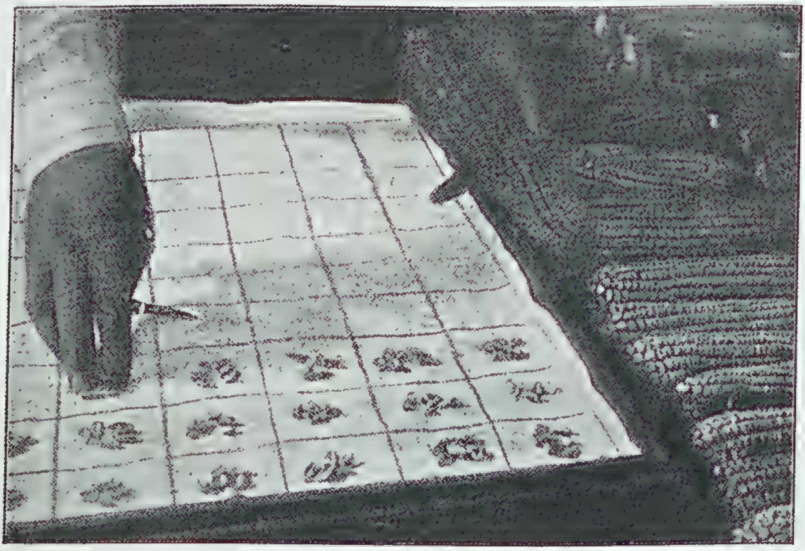
THE MOST SUITABLE SOIL

for maize production is found in the rich alluvial scrubs both on the coast and inland, on the deep, well-drained, loamy soils, such as are found on our river flats, and on the volcanic and alluvial soils of the West, from the Main Range westward. The pioneer maize-growers fifty years ago grew splendid crops of "corn," ranging from 70 to 100 bushels per acre, on the newly-cleared scrub lands of the Brisbane River, Oxley, and Moggill Creek, by very primitive means, and even to the present day the same means have to be adopted on such lands, covered as they are for the first three years after clearing, with innumerable stumps and permeated by a network of roots. In such localities corn can only be planted by means of the hoe, three or four seeds being dropped into a shallow hole and covered by a backward stroke of the hoe. No after cultivation of the soil is possible, nor is it needed owing to the extreme richness of the soil, and the great amount of wood ashes remaining after burning off the timber. During the first season, after the scrub has been burnt off, there are few weeds to trouble the crop, which grows with surprising rapidity and gives heavy returns. In the following seasons, however, weeds, especially summer grass, will be very much in evidence, and these must be checked by regular "chipping" if the maize is to flourish. As soon as the land is clear of stumps (many of which will have rotted out during the lapse of three years), it is necessary to go in for improved implements and methods of cultivation.

SELECTION OF SEED.

Too much care cannot be exercised in the selection of seed. It is courting disaster to take seed indiscriminately from a bag. It should only be taken from the very best cobs, and from these the top and bottom ends should be discarded, and only the large, even seeds from the middle selected. Corn intended for seed should be allowed to thoroughly mature on the stalk. When gathered it must be placed in a crib where there is thorough ventilation. If it is placed in a warm, damp barn, there is danger that the corn will begin to germinate or mould as a result of the moisture and warmth. The method of selection in America is thus described in the Orange Judd Company "Book of Corn":— "Probably there is no better way to sort and prepare the seed corn than to place forty or fifty ears on some boards or on a table with all the tips pointing one way. Select an ear that most nearly represents the type you prefer. With this ear in your left hand, go over all the ears on the board, and, with the right hand, push out those ears which show too great variation from the type in size, length, shape, roughness, colour, size and shape of kernels, &c. Now gather the few remaining ears together, and, with a knife, remove three or four kernels from each ear and place them in front of that ear, with the germ or 'chit' side up. Now go over these kernels carefully, for here is where we have failed most in the past. We have studied the ears, but have paid little attention to the kernels. First discard those ears which have kernels unusually broad, long, or thick, also those which are very narrow, thin,

or short. This is absolutely necessary before we can expect any planter to drop a uniform number of kernels in each hole. Discard all ears with kernels which are shrivelled, or are too pointed, indicating low



vitality and poor feeding value. The butts and tips should now be shelled off and the ears shelled separately. But this is not all. This

PROPER AND IMPROPER SHAPES OF KERNEL.
Wedge-shaped, square, too nearly round.

corn is not ready for the planter till it has been picked over by hand, removing the broken, rotten, discoloured, irregular, weak, and chaffy grains. This seems like a great deal of trouble and expense, but no

farmer can afford to do less than this. When it is remembered that it is possible for a bushel of seed corn to return us seven hundred bushels next harvest, we can readily see the folly of neglecting this work. What is a day, or even two days, spent on this bushel of seed corn?"

Losses of seed owing to depredation of bandicoots may be greatly minimised, if not entirely prevented, by soaking the seed in tar. This has no injurious effect on germination, but the offensive smell deters the vermin from uprooting the seed.

THE BEST VARIETIES TO GROW.

There is no absolute unanimity amongst corn-growers in this or any other State as to the best variety to grow, either for early maturity, prolificity, number of rows of grain, regularity of rows, &c. This, as in the case of many other cereals, as well as of farm crops, vegetables, fruits, and timbers, depends entirely on the locality, soil, and climatic conditions.

On this subject of seed selection, Mr. T. Jones, manager of the State Farm, Warren, wrote in the February issue of the "Queensland Agricultural Journal" for 1912, as follows:—

"Maize seed should be selected while on the stalks in the field, because it is here that the habits of the corn are displayed. The size and length of shanks, the height of the cob on the stalk, the healthy condition of the stalk, as well as the healthy condition of growth—viz., foliage and cobs free from grubs—can all be observed.

"It is not always wise to select the largest cob for seed, because very large cobs mostly owe their size to exceptional conditions during growth; neither is it wise to select cobs that stand too upright on the stalks, because such cobs readily take in rain, thus making shoots grow out from the ends of the cobs.

"The cob on a shank that will slightly bend is the cob to select.

"It is essential that the stalks should be strong and healthy at the early stage of growth, in order to support the cobs; otherwise the crop may be knocked down by the rain and destroyed.

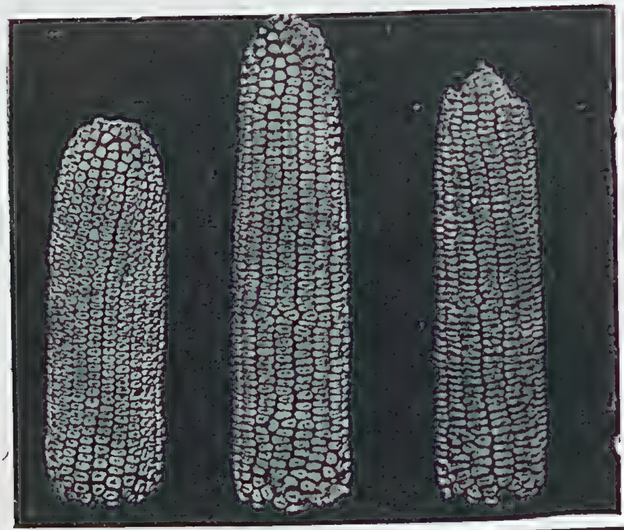
"Another point in field selection of maize is to see that the husks extend well over the points of the cobs. This protects the cob from the cotton-boll worm, and also from the weather.

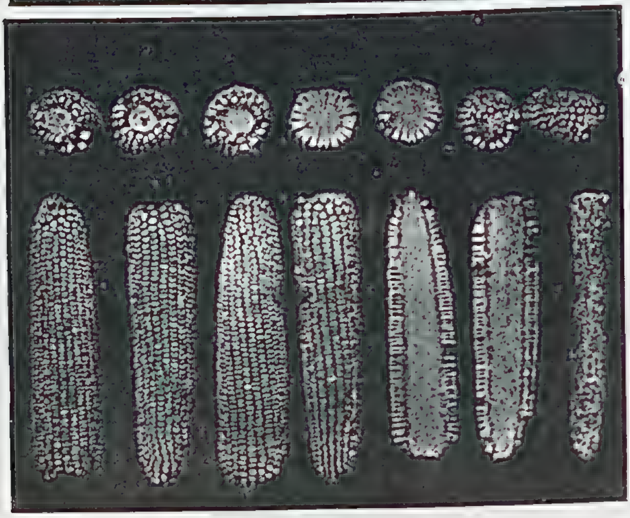
"Select cobs that are not too high on the stalks, from stalks that have grown under difficult conditions, not forgetting that the shank should be slightly bent.

"The time to select the seed is when some of the cobs are ripe, some ripening, and some green. At such stages it is easy to determine the early, medium, and late maturing varieties. Careful selection on these lines will enable a maize-grower to establish a plant suitable for his requirements.

"Great care should be taken in the thrashing of the seed, and, as it requires such a small quantity per acre, I would advocate hand thrashing so as to prevent any possible cracking of the grain. The ends of the cobs should be discarded, the grains being smaller. It is essential to have maize seed of uniform strength, and, to ensure this, the seeds must be selected from the centre of the cobs. Uniform strength in seed means a uniform crop."

BOONE COUNTY WHITE.





LEAMING.

The lateness or earliness of the local season must also be taken into account in choosing a variety, as the time it takes to mature will depend somewhat on these circumstances.

In districts close to the coast, where there is a good rainfall, and a rich, well-drained, deep soil, a large type of corn is most likely to prove successful and give a heavy crop. Typical of this class is the Hawkesbury Champion and Clarence River. Once away from the coastal

district and the rich scrub lands, the seasons generally experienced demand a variety which will mature its grain quickly. Probably no better type of maize for this purpose than the Leaming can be found.

Another good early-maturing variety is Hickory King. This is a white-seed maize which was imported from America in 1904 by the Department of Agriculture and Stock, and is one of the Dent varieties.

BOONE COUNTY WHITE.

The Leaming has the most uniform characteristic of any variety of yellow corn grown. Its adaptation to widely different conditions of soil and climate by selection has done much to strengthen these characteristics. It is, no doubt, the type from which many varieties of yellow corn have been developed, as most of the yellow varieties show some of the characteristics of the Leaming corn. These characteristics are:—

Ear tapering; circumference 7 in.; length 9·3 in.; kernels firm on cob and mostly upright; number of rows, 16 to 24, with a tendency

to drop rows about the middle of the ear; space between rows, medium, kernels in distinct pairs of rows, mixed at the tip; but moderately rounded, slightly compressed, with tendency to expand; kernels, yellow, wedge-shaped, with square-cut summits and nearly straight edges, long dimpled to pinched dented; shank medium to large; cob, medium, red.

In the Hickory King variety the grain is so large and the cob so small that, by breaking the ear in half, one grain will cover the entire end of the cob. The ears grow 7 to 9 in. in length, and 6¼ to 6½ in.

MAIZE GROWN AT WESTBROOK STATE FARM.

in circumference, and are generally borne 3 to 6 on one stalk, thus making it enormously productive. It ripens early, maturing in 110 days from planting. It is particularly adapted to and will yield more in thin soils than any other variety of field corn, and, if planted on good soil, will bear much closer planting than other varieties.

Legal Tender is a good yellow corn for our coast districts. It yields heavy crops, up to 100 bushels per acre. The cobs run from 7 to 9 in. in length. Comes to maturity in about 100 days.

Another useful corn for the coastal lands is Golden Superb, a yellow corn, not a very good keeper, but a good farmer's corn for prompt sale.

Golden King produces a large cob and large grain. It is a heavy cropper on the Downs country, but does not do so well on the coast. The earliness of maturing can only be obtained by selection in the

field. The average farmer can improve the yield by choosing the finest cobs in his crop, especially those which show the largest number of rows, evenness of the rows, with the least space between them.

These characteristics will, however, eventually be lost on the average farm, for the general farmer will never "breed" corn. Corn-breeding is a special industry in America, as it should also be here, and, when special varieties are wanted, adapted to any particular conditions of soil and climate, these strains must be obtained from the breeder. As a rule, the very best seed will not remain pure for more than four or five years. It then becomes necessary to again secure well-bred seed. The advantages of improved seed-corn are numerous. For instance, improved corn tends to diminish the percentage of barren stalks, a most important matter, because such stalks represent a direct loss to the farmer. Statistics have proved that loss from this cause amounts to from 10 to 15 per cent. Again, in the average field, the ears of corn are not uniform in size, many being small and stunted, with few rows of kernels, and those wide apart. It is the province of the corn-breeder to increase the uniformity of the crop, to regulate the proportion of corn to cob, to fill out the ends, and increase the number of kernels, all of which matters the general farmer has no leisure to attend to.

Writing on varieties of maize most suitable to Queensland conditions, Mr. G. B. Brooks, Instructor in Agriculture, Department of Agriculture and Stock, says:—

"In districts where the conditions of soil and climate are specially suitable, strong-growing late sorts, such as Golden King, Hickory King, Sydney Red, and Horsetooth, are invariably grown as the main crop. For planting late in the season and in localities where conditions are not so favourable, a more quickly maturing and lighter-stalked maize is favoured. There are numerous varieties of this type, the most commonly grown being Early American, Early Leaming, Early Yellow Dent, and 90-day.

"At the present time of writing (April, 1912) the Department has several plots of stud maize growing in the Kingaroy district. The seed was imported from America two years ago, and was acclimatised at the State Farms, and now a comparison is being made between it and the locally grown varieties, some of which yield as high as 130 bushels per acre. The varieties being tested are: Hildreth, Hogue's Yellow Dent, Legal Tender, and Early Leaming.

"There is very little pure-bred seed maize raised in Queensland. Stud varieties have been introduced from time to time, but no care is taken by the farmer to keep it pure. It is invariably planted alongside hybrid sorts, with the result that cross fertilisation takes place.

"Selection of seed generally consists here in taking a bag from the bulk when shelling, and good, bad, and indifferent seeds are indiscriminately mixed up, and when the resulting crop does not come up to expectations the farmer tells you that the variety has run out."

Mr. Brooks' notes on the above subjects bear out exactly what I have previously stated with regard to selection of seed.

PREPARATION OF THE LAND.

As well as on selection of seed, the success of a corn crop depends largely on the proper preparation of the land, and few plants are more responsive to proper tillage. I am not here dealing with maize-planting on newly-cleared scrub land, where the virgin soil is of great depth and of marvellous fertility, consisting as it does of the vegetable *débris* which have accumulated for ages before the white man appeared in Australia. On such lands tillage is at first impossible, owing to stumps and roots, and is besides needless, owing to the loose texture of the soil to a great depth. I am assuming that the corn land is cleared of all stumps and in a condition which admits of the use of any description of farm implement, whether horse or steam driven.

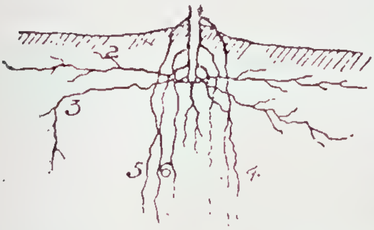
ROOT SYSTEM.

ROOT DEVELOPMENT—FORTY-FOUR DAYS AFTER PLANTING.

To show the necessity for deep tillage, experiments have shown that maize roots will strike downwards as far as 8 ft., yet the main bulk of the roots generally develop at a depth of 8 in.

In experiments made in the United States, it was found that a dense network of feeding roots, reaching from row to row, completely permeated the whole soil area below the cultivated portion, and that the fourth inch of soil contains a larger amount of roots than the 3 in. above it, or the 4 in. below it, and nearly as much as both together.

The fourth biennial report of the Kansas State Board of Agriculture gives the following description of the position and distribution of the corn roots in the soil to a depth of 4½ ft., and indicates the office of each class and their orderly arrangement and development at a certain time for a certain work. The seed roots sustain the bud until the first green leaf appears. The first roots then follow, and seek the surface soil, which first feels the sun's warmth. These are in turn supplanted by the first roots that radiate from the butt end of the stalk like the ribs of an umbrella from the shaft, and spread out on a lower level, usually 5 in. to 10 in. below the surface, and often exceed 8 ft. in length. These first circle roots are the main food gatherers, and send out numerous



ROOT DEVELOPMENT OF CORN IN THE FIELD.

fibrous branches, in the direction where water and food are most abundant and temperature most favourable. The second and subsequent circle roots developing one after another as the plant increases in height, and the soil is warmed to a greater depth, seek the subsoil, and rarely spread out on the surface. Figures 2, 3, 4, and 5 show such roots, which were followed to a depth of 4½ ft., with no terminal point in sight.

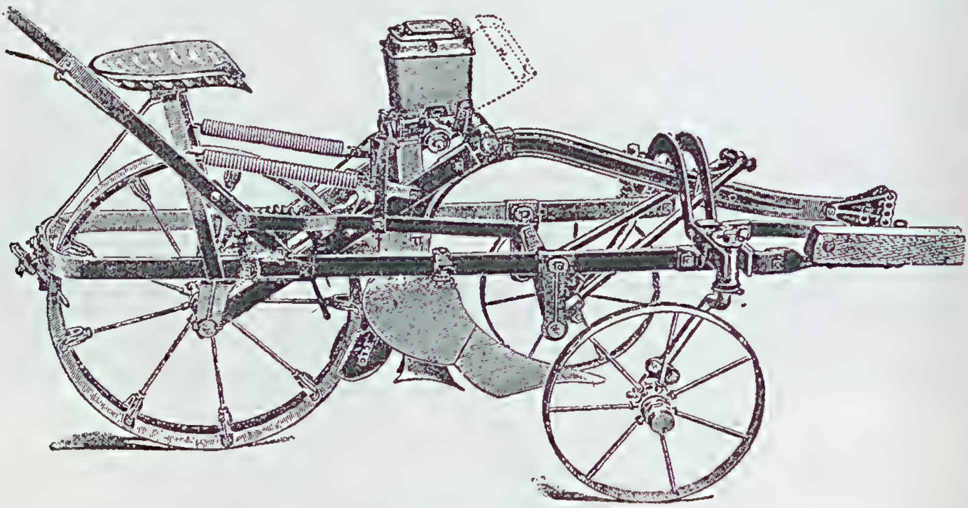
Numbers 1, 2, and 3 are surface roots, or food gatherers; 4, 5, and 6 are subsoil roots.

The essential thing in the cultivation of maize is to keep the soil free from weeds, and covered with a soft soil mulch.

Now, this would point to a seeming contradiction. Notwithstanding what I have shown to be the deep root system of the plant, which naturally indicates a necessity for deep cultivation, the results of fifty-six tests at seventeen Agricultural Experiment Stations in America have shown an average increase of 42 per cent. resulting from shallow cultivation as compared with deep cultivation. It has long since been determined that cultivation conserves soil moisture, and makes the ground warmer. At the Wisconsin Station, cultivation 3 in. deep left the ground more moist below the cultivated layer than cultivation 1½ in. deep. If the methods of maize cultivation are based on the root development, it would seem that level cultivation 2 in. to 3 in. deep is most logical. This refers, be it noted, to the after cultivation of the crop—not to the preliminary preparation of the land. In view of the deep-rooting habit of the maize plant, it is advisable, particularly in heavy soils, to not only plough to a depth of 9 in. or 10 in., but also to subsoil down to 18 in. or 20 in., although the latter operation may not pay in the first season, but certainly would in two or three successive seasons.

PLANTING.

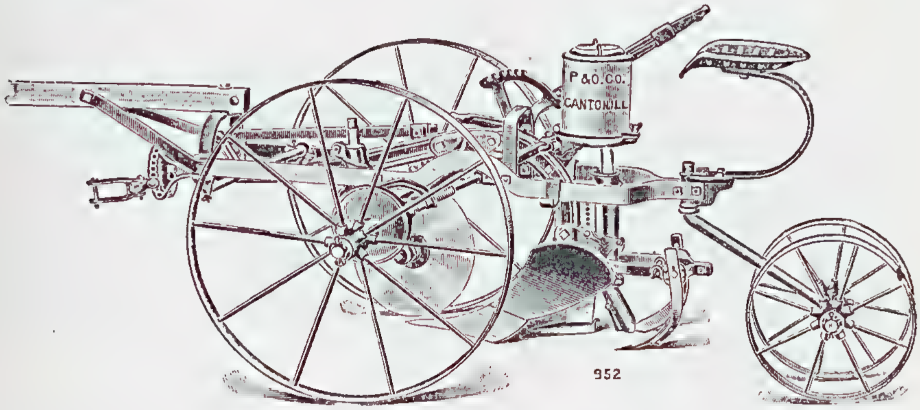
Planting may be begun in the South as soon as the frosts are over. In normal seasons this would be in September, or in very sheltered situations even in August, but late frosts often occur in October. Fortunately, maize may be planted from September to January, and the writer has even harvested a good crop of 90-day corn sown at the end



SEED DRILL FOR MAIZE.

of February. A good plan is to plant one field in September, another in October, and then wait till the end of November to begin to plant the late crop. In this manner one is sure, given good weather conditions, of a crop every year on at least two-thirds of the planted ground.

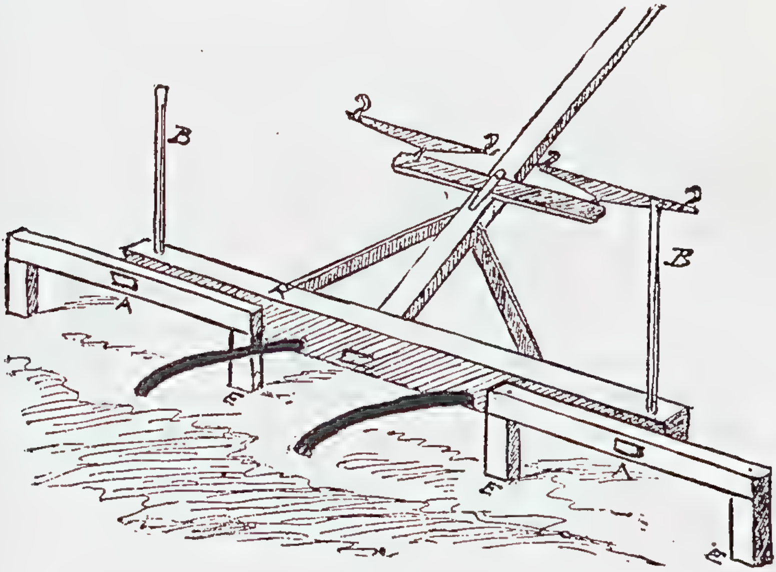
The seed may be drilled in or dropped by hand. The rows are first marked out at the required distance apart by a simple home-made corn-marker as here illustrated.



CORN DRILL.

To obtain the best results, the rows should be 4 ft. apart, and the plants 12 to 15 in. apart in the rows for small varieties, and 5 ft. apart and 18 in. in the rows for tall-growing sorts.

When planting maize, it is customary to also plant in the same field pumpkins in every fourth or fifth row, and the combination of the



CORN MARKER.

two crops is very successful and profitable. There is plenty of time to till the land and keep the weeds in check, before the pumpkin vines begin to run. Then, when they do this, they cover the soil with their

broad leaves, thus checking the growth of weeds, and keeping the soil cool and moist during the great heat of summer. Finally, when the corn is harvested, the ground is covered with a vast number of pumpkins, valuable as food for stock, and generally selling at a good price. For after-cultivation before the pumpkin vines begin to run, there is nothing equal to a careful, thorough harrowing by means of lever harrows, with the teeth slightly standing backward. If this work is properly done, not one corn plant in a thousand will be injured, and all the rest will be greatly benefited. The thorough pulverisation of the soil near the young stems will facilitate the formation of growth, give increased circulation to them, and consequently, quick, vigorous growth. Never be afraid to run the harrows over the young seedling corn. Later on, scarifiers may be used, but only at shallow depths, as previously stated. Now the crop may be left to itself.

When the cob or ear has properly formed, it is sometimes customary to cut off the tops of the plants above the cobs and utilise them as fodder. Some have also an idea that this tends to increase the size of the cob, but this is very problematical, since the latter has already reached its full development before the tops are removed. It is also very questionable whether the amount of fodder thus obtained is worth the expense of cutting it.

[TO BE CONTINUED.]

ARTESIAN WATER SUPPLY.

PRELIMINARY REPORT RECOMMENDATIONS OF INTERSTATE CONFERENCE.

A preliminary report of the Interstate Conference on the artesian water supply, which has been forwarded to the New South Wales Government, urges that uniform legislation should be adopted for the control of artesian bores, existing and future. The interests of several States, it advises, are involved with regard to more than one of the artesian bores, and legislation should in future be on the lines of the Acts already in existence in New South Wales and Queensland, where provision is made for licensing and supervising boring methods, and for periodical examination of bores.

The conference was of opinion that, in regard to the controversy as to the origin of artesian water and the cause of its flow, the water is almost wholly, if not entirely, derived from rainfall, and that it percolates the porous beds under the influence of hydraulic conditions.

The following are some extracts from the report :—

" The question has frequently been raised as to the probability of their being one or more outlets to the great Australian Artesian Basin, or, in other words, whether the porous water-bearing beds do not extend to the edge of the ocean, and form the vehicle for the escape of the surplus water into the sea.

"The possibility of there being such an extension southwards from Wilcannia, whereby the water of the great Basin might feed the Murray River Tertiary Basin of New South Wales, Victoria, and South Australia, and might flow thence to the South Pacific Ocean, has been persistently dwelt upon.

"We are of opinion that no such extension exists, as there appears to be a bar of Palæozoic rocks extending across the valley of the Darling at Wilcannia. We think, however, that the Tertiary Basin probably extends northwards nearly to the southern boundary of the Great Artesian Basin and that it (the Murray Tertiary Basin) may possibly to some extent be fed by the waters of the Darling River, which flows over the eocene calcareous sandstones of the Murray Basin for a considerable distance. The Murray Basin is known to receive some of its water from underground flows below the river plains of the Upper Murray.

"The only outlet to the Great Australian Basin of which we have any definite knowledge is situated on the northern shores of Australia, where the Lower Cretaceous rocks, in which in the Queensland portion of the basin the water is contained, have been proved to extend along the margin of the Gulf of Carpentaria.

DELIMITATION OF THE BASINS.

"It is very necessary that all the Australian States should adopt a similar scheme of delimiting and topographically surveying the artesian basins, and that, in this connection, it is most important that the levels of the bores should be taken, in order that the lines of equal pressure may be chartered, with the object of showing the direction of flow of the artesian water, and more exactly determining its place of intake.

"New South Wales and Queensland have practically finished a preliminary survey of the intake beds and that in New South Wales levels, reduced to a standard datum, have been taken over the greater portion of the basin. Queensland also is carrying out an accurate system of levelling over the artesian basin.

"Two survey camps should be able to complete this work in South Australia in a few months if working continuously.

"This great basin is undoubtedly the largest artesian area in the world, but at the same time there has probably been less work done on it than on any other artesian basin known.

"It is therefore most important, we urge, that the Governments of the various States should enable their officers to complete the work of surveying it.

HYDROGRAPHIC SURVEY.

"We are unaminously of opinion that the question of gauging the river flows is one of the most important matters that have to be dealt with, because, without particulars as to the river flows, and also as to evaporation at the different localities, we cannot possibly arrive at a determination of the quantity of water which is annually being poured into the artesian basin, and as to what proportion that amount bears to the annual rainfall.

"It is evident that, so far as the Great Australian Artesian Basin is concerned, Queensland and New South Wales are the States upon which the bulk of this work will fall. At the same time, we urge that the other States should co-operate so far as the smaller basins are concerned.

"The work of measuring the flow of all streams, where they cross the eastern and western boundaries of the intake beds of the Great Australian Basin in Queensland and New South Wales, is absolutely essential, and should be proceeded with as speedily as possible, in order that the amount of water absorbed may be ascertained, and some idea gained as to the extent to which the artesian water can be drawn upon without risk of exhausting the supply. The measurement of the rate of evaporation should also be effected simultaneously, in order to discover what proportion the water absorbed bears to the actual rainfall.

"We urge that similar measurements be made in the other States—viz., Victoria, South Australia, and Western Australia—in regard to the smaller basins, as valuable information will thereby be obtained to help to a thorough understanding of the whole question.

"We recommend that this gauging work, when once commenced, be carried on continuously, and that the sites of the gauging stations be fixed by an engineer in conjunction with a geologist."

SOME RECOMMENDATIONS.

The conference recommends that a uniform and complete system of measuring and recording the volumes of water yielded by all bores, whether private or public, within the limits of any artesian basin, should be commenced immediately, and carried on by all the States; a uniform system of collecting and designating the rocks obtained in boring; that solid samples of every change of rock met within a bore should be kept in a box, with the depths from which they were obtained accurately noted; a uniform system of casing; that the chemists of the different States should adopt a common scheme of returning analyses of artesian waters, so that the distribution of the acids amongst the bases may be made in the same order of preference; and that samples should be taken at the bores in such a manner as to enable the different gases and their volumes to be determined.

DECREASE IN FLOW.

It is pointed out that periodical measurements of the flows of those bores in New South Wales and Queensland which have been in existence for some years proves conclusively that there is a general decrease in the flow of the great Artesian basin, and experience has shown that the same thing is true in regard to the Perth Basin, in Western Australia. The conference is of opinion that the decrease is not due, at all events to any considerable extent, to the escape of the water outside the casing. Nevertheless the loss in this direction should be minimised by bedding the casing upon an impermeable stratum, and sealing it with cement. When this is done waste of water should be prevented by shutting off the flow when it is not required.

In those States where no provision has already been made by legislative enactment to prevent the unnecessary multiplication of bores, due provision

should be made to secure the effective conservation of the underground water resources of the basin. For this purpose a board, composed of competent officials, should be placed in control of existing bores in each State, and no new bores should be allowed without its authority.

UTILISATION OF ARTESIAN WATER.

"It is believed," says the report, "if agriculture on a large scale were permitted with bore water in what are now regarded as pastoral districts (assuming that bore water can be advantageously used for this purpose), the demand would become so great that it would result, within a very short period, in the depletion of the flow to such an extent that sufficient water would not be available for pastoral purposes.

"In view of the clearly demonstrated fact that there has been a considerable diminution of the artesian flow, we strongly recommend that no new irrigation enterprises be approved until the investigations recommended by the conference have been sufficiently advanced to enable reliable estimates to be formed of the volumes of water available.

"In Queensland many bores are utilised for the production of power, by means of turbines, Pelton wheels, and other hydraulic prime movers, for, *inter alia*, operating sheepshearing, electric-lighting, and woolscouring plants, and also for domestic purposes. While we are of opinion that the most important primary use to which Australian artesian water can be put is in connection with the pastoral industry, we also think that its legitimate use for the abovementioned purposes may be sanctioned.

"It is, of course, obvious that town supplies are of paramount importance, and no restriction in connection with these is proposed."—"Dalgety's Review."

THE FARMER'S SHEEP.

By W. G. BROWN, Sheep and Wool Expert.

The Border Leicester has a somewhat recent beginning. It is a combination of the New Leicester with the Cheviot. The Cheviot is an ancient breed, which has existed for ages on the borders of England and Scotland. It is a very hardy sheep, not unlike the Leicester. By crossing the Cheviot and the Leicester, a new type was formed, combining the qualities for which the Leicester is famous and the hardiness of the Cheviot. It is a very early-maturing sheep, has a fair fleece, a good carcass, and is rapidly coming into favour, both for first cross or second. The Border Leicesters are prolific.

The Romney Marsh sheep has existed for hundreds of years, and has inhabited the fens of Kent from time immemorial. They are large and coarse animals, rather smaller than the Lincolns. Within the past forty years, however, they have been improved by an admixture of Leicester blood, and are now represented by a big sheep which yields a medium quality of fleece. It has a good constitution, and is not so liable as many other breeds to the attacks of disease. It is intermediate in type, between the Lincoln and

Leicester. For swampy, ill-drained land or a humid climate, it is a first-rate farmer's sheep, and should do well on the coastal belt.

The Cotswolds and *Cheviots* are other long-woolled breeds, but little generally is known of these in Queensland. The Cotswolds were tried by the late Hon. James Taylor, of Cecil Plains, Dalby, and, I believe, by Messrs. J. and A. Porter, of North Branch, twenty-five years ago, but for various reasons were not persevered with, and were allowed to die out.

Reviewing the foregoing descriptions of the breeds, it appears that, of the four which have become best known to Australians, the Lincoln is big and robust, has a big fleece of true wool, and is a gross feeder; somewhat slow in maturing, he is a saleable sheep if carried over from the lamb stage, and has a lineage which goes back for a thousand or more years. The Leicester, finer in bone, carcass, and wool, matures earlier than the Lincoln, and is prolific; it is somewhat delicate in constitution as compared with the Lincoln. The type has been fixed for nearly 100 years.

The Border Leicester has all the qualities of the Lincoln, plus a greater hardihood; it is prolific and early maturing; and a composite animal of modern origin. The Romney Marsh, which in bone, carcass, and wool, is intermediate to the Lincoln and Leicester, with a special quality of being adapted to running in swampy country better than any other breed; it, too, has been improved by admixture of other blood.

It is difficult to fix on any one breed as being the most suitable for Queensland, where there is a wide diversity of climate and natural conditions, but, generally, one can say that on the rich land of the Downs, and, I believe, on the cultivated areas of the coastal belt, it will be found that for the first cross on the merino the Lincoln will give a first-class dual-purpose sheep.

In cross-breeding in any class of stock, it is axiomatic that the sire and dam must be of pure lineage themselves. The Lincoln is ancient, and the Merino was pure 2,000 years ago; they are both true wool-producers; and the Lincoln, with its big carcass and general robustness, transmits size and capacity for assimilating the coarse food which is to be found on every farm (and which, by the way, is usually burnt or ploughed in). Therefore, given a large-framed plain-bodied Merino ewe, I cast for the Lincoln as being most likely to produce the best animal for a farmer. Such an animal as his progeny is saleable at any stage of his life.

So much for the first cross to produce a dual-purpose sheep for the farmer. We have found an animal which gives a big carcass, and produces a good quantity of payable wool; but there is another consideration to be taken into account—*i.e.*, the profitable raising of lambs. As we have seen, the Merino is slow in coming to maturity; the Lincoln, too, is slow in comparison with other British breeds; and it is very important that as early a

maturing animal as possible shall be produced. It is here that much controversy and experiment has taken place in the past twenty years in Australia.

It goes almost without saying that the sooner a sheep is turned into money the better chance there is for a farmer to make a financial success of the business; and it has been the great aim of breeders to produce an early-maturing lamb with a decent fleece.

Seeing that the Lincoln-*cum*-Merino cross is likely to be slow in maturing, it is necessary to look around for an animal possessing the quality of early maturity, and which is likely to transmit it to its progeny. It must possess, too, a good carcass, and as good a fleece as is possible in an animal which is bred primarily for its flesh.

We have these in what is called the short-woolled or Downs breeds. One or two of the long-wools may also be added to the list.

Of the comparatively large number of breeds offering, five stand out as being pre-eminent in early maturity and size of carcass. Their fleeces range in value from good to inferior. They are named as follow, taking them in order as to the value of fleece production:—

South Down.
Shropshire.
Hampshire.
Oxford.
Suffolk.

Besides these there are others, such as the Dorsets and Roscommon, which are unknown, I believe, in Queensland, all of which, with the exception of Dorsets, perhaps, are composites of other British breeds. I am taking into account only those which have been tried here, and they are comprised in the above list of five.

The South Down is a pure breed, whose descent can be traced from a date prior to the Conquest. It stands first among the short-woolled breeds of Britain, not only on account of the fineness of its wool, but of its fattening and meat-producing qualities. It is not, however, as hardy as some varieties. It possesses a beautifully proportioned frame, covered with a short fine wool. Its fleece is very light in weight. It matures comparatively early, being excelled in this respect by only one or two other breeds. It is the foundation stock of all the other Downs breeds.

The Shropshire, according to Professor Bowman, is a cross between the original horned sheep and the South Down. The foundation stock was probably the Morfe Common sheep, which still exists in Shropshire, and which produces a superior quality of wool; but it has been crossed with other breeds, particularly the New Leicester and Cotswolds, as well as the South Downs, and consequently several variations from the original have been produced.

The Shropshire itself, because of its mixed blood, perhaps, does not throw so truly to type as some of the pure breeds. It is larger in frame than the South Down, which breed, as we have seen, is among its progenitors. It is noted for its excellent mutton and early maturity, and is much more robust than the South Down. The Shropshire is essentially a mutton breed, and is a great favourite with the butchers. Recently the trade issued a circular note to breeders which was published in the stock journals far and wide, in which the sheep farmer was strongly advised to use the Shropshire as a sire in the production of fat lambs. That is a very strong recommendation indeed. Other factors, however, must be considered in discussing the best breed for a farmer.

In Australia the great boom in this breed of seven years ago caused a large proportion of inferior animals to be put upon the market, with the result that a great falling-off in quality became apparent, and a consequent neglect of this useful breed. There is no doubt, however, that it will come again into use in certain localities.

The Hampshire is a comparatively little known breed in Australia, although several comparative experiments have been made with them in connection with other breeds; it, too, is a composite animal, being a cross between the South Down and the Shropshire. In quality and quantity of fleece, it resembles the South Down.

The Oxford Down sheep is somewhat similar to the Hampshire. Very little is known of the animal, practically, in this country. It is highly esteemed in Britain.

The Suffolk is regarded as having been derived from an ancient breed, the Norfolk. In 1806 South Down rams were put to Norfolk Downs ewes, and the result was—the Suffolk. They are not generally known in Australia, but I had the opportunity of seeing a flock of this breed on Mr. Thonemann's farm, near Dalby. With an inferior fleece, this herd seems to possess all the qualities which a true mutton sheep should have: it matures much earlier than any other, the breeder preferring to use his rams at from seven to eight months old. As wethers they are fit for the butcher at twelve months if well fed, and they are excellent "doers." Mr. Thonemann informed me that he has had as high as 165 per cent. of lambs in one drop. It appears to be a very hardy sheep.

These are the principal and best known of the Downs breeds. They are noted for early maturity, fecundity, good quality of mutton, and, as compared with the long-wools, inferiority of fleece. If it can be shown that they transmit their qualities to their progeny, it only remains to review, compare, and choose the best for all purposes.

There is a good deal of evidence obtainable in current stock journals, and in reports from State farms, besides the experience of some of our own breeders. In the next article will be given the results of several interesting trials in several of the breeds under review—a general summary with conclusions.

[TO BE CONTINUED.]

COMPLETE FERTILISERS FOR FARM AND ORCHARD.

[CONCLUDED.]

By J. C. BRÜNNICH, Chemist to the Department of Agriculture and Stock.

A standard manure for citrus fruits can be made up, in accordance with any of the following formulæ :—

$$\left.\begin{array}{l}\text{2 cwt. superphosphate}\\ \text{1½ cwt. sulphate of potash}\\ \text{2 to 3½ cwt sulphate of ammonia or nitrolim}\end{array}\right\}\text{ per acre;}$$

or,

$$\left.\begin{array}{l}\text{2 cwt. Thomas phosphate}\\ \text{1½ cwt. sulphate of potash}\\ \text{3 to 4½ cwt. dried blood}\end{array}\right\}\text{ per acre;}$$

or,

$$\left.\begin{array}{l}\text{4 cwt. meatworks manure (with blood)}\\ \text{1½ cwt. sulphate of potash}\\ \text{1½ cwt. nitrate of lime}\end{array}\right\}\text{ per acre.}$$

The same quantities in pounds may be applied to trees of medium size, bearing in mind that trees about five years old require from 4 to 6 lb. of any of the above complete fertilisers, and that the amount can be increased up to 20 lb. per tree for very old large trees.

Fertilisers should be supplied regularly every year, and the manure should be well forked, chipped or cultivated in.

In an old orchard the manure should be applied broadcast over the whole area. It is always advisable to divide the above quantities of manures into two lots, and apply one half towards the end of winter, in July or August, and the other in December or January.

In order to allow anyone who has only a few trees to make up a dressing for each tree, a few complete fertilising mixtures are added, of which the lesser amounts are for young trees and the larger amounts for older trees :—

1.

2 to 6 lb. superphosphate
1 to 2 lb. sulphate of potash
2 to 4 lb. dried blood.

2.

2 to 6 lb. superphosphate
1 to 2 lb. sulphate of potash
1 to 3 lb. nitrolim or sulphate of ammonia.

3.

4 to 8 lb. bonedust
1 to 2 lb. sulphate of potash
2 to 4 lb. dried blood.

4.

3 to 7 lb. Thomas phosphate
1 to 2 lb. sulphate of potash
2 to 4 lb. nitrate of lime.

5.

4 to 16 lb. of a ready mixed fertiliser containing about 6 per cent. of water-soluble phosphoric acid, 10 per cent. of potash, and from 6 to 10 per cent. of nitrogen.

LETTUCE.

Lettuce requires a rich loam, in order to grow very quickly, and in good soil the addition of artificial fertilisers will produce large crisp plants.

Use per acre 8 to 12 cwt., or per square yard 3 to 4 oz., of a fertiliser containing 6 to 8 per cent. phosphoric acid, 4 to 6 per cent nitrogen, and 8 to 10 per cent. potash; or the following mixture:—

4 to 6 cwt. superphosphate
$1\frac{1}{2}$ to 3 cwt. sulphate of potash
2 to 4 cwt. nitrolim or sulphate of ammonia
} per acre.

LUCERNE.

Lucerne, one of our most valuable fodder-plants, grows well on rich loams, and clayey soils, containing plenty of lime, and having a mellow, fairly open, or even gravelly subsoil. Clayey soils, deficient in lime, may be made to grow lucerne if the land is heavily limed, with ground limestone, at the rate of one to three tons per acre. Some light sandy soil, with a clayey or gravelly subsoil, may also be made fit for lucerne by liming. Nitrogenous manure is, as a rule, not required, but a small dressing with nitrolim or nitrate of lime, at the rate of $\frac{1}{2}$ to 1 cwt. per acre, at the time of sowing, may act as a stimulus and give the plants a chance to establish themselves in poorer soils. The plant requires an ample supply of potash and phosphoric acid, and an annual application of 3 to 6 cwt. of a fertiliser mixture, containing 6 to 8 per cent. phosphoric acid and 10 per cent. of potash, is to be recommended.

The following manures may be applied broadcast every year:—

2 to 3 cwt. superphosphate
1 to $1\frac{1}{2}$ cwt. sulphate of potash or muriate of potash
} per acre;

or,

3 to 4 cwt. Thomas phosphate
$1\frac{1}{2}$ to 3 cwt. kainit.
} per acre.

MAIZE (See CORN).

MANDARINS (See LEMONS).

MANGO.

This tree will grow in almost any soil, from a sand to a heavy loam, amongst rocks, on gravelly and on shaley soil; it will thrive best, however, on a good loamy soil, containing plenty of lime, and under tropical conditions, as it will not stand heavy frosts. Young trees benefit mostly by a good mulching with farmyard manure. Older trees may be fertilised with artificial manures, applied in holes made by driving a crowbar into the ground, at

intervals all round the tree, extending from 2 to 7 or more feet from the stem. A mixed fertiliser—

3 to 6 lb. superphosphate	per tree,
2 lb. sulphate of potash	
1½ to 2 lb. nitrolim or sulphate of ammonia	

is distributed amongst the various holes, which are then covered or filled up with soil.

For very large trees the quantities of fertilisers may be nearly doubled.

MANGOLDS (MANGEL-WURZEL).

Mangolds, like Swedes and beets, are a very exhaustive crop and require a fairly rich loamy soil. Whenever possible from 10 to 20 tons of well-rotted farmyard manure should be applied, per acre, when preparing the land for sowing. This crop is one of the few which prefers the potash in the form of chloride or muriate, and if the usual sulphate of potash is used, an equal amount of common salt may be added. The following mixture of artificial fertiliser will be found to give greatly increased crops :—

2 to 3 cwt. superphosphate	per acre.
1 to 1½ cwt. muriate of potash	
2 cwt. nitrolim or sulphate of ammonia	

or,

2 to 3 cwt. superphosphate	per acre.
1 cwt. sulphate of potash	
2 cwt. common salt	
2 cwt. nitrolim or sulphate of ammonia	

MARROWS AND SQUASHES.

Marrows do best on a fairly rich loamy soil, with a stiff subsoil, and many of our scrub soils are particularly suitable for these vegetables. With the aid of artificial fertilisers they may be grown on lighter soil, in which case the amount of artificial fertiliser may be increased up to 8 and 10 cwt. per acre or 8 to 10 lb. to every square yard.

The following mixed fertiliser will be found suitable :—

3 to 4 cwt. superphosphate	per acre.
1½ cwt. sulphate of potash	
1½ to 2 cwt. nitrolim or sulphate of ammonia	

MUSTARD.

This very quick-growing annual is frequently grown as a forage plant, but also makes a very valuable green-manure crop. In order to get a heavy crop on light soils, requiring green-manuring, the following mixed fertiliser may be used with advantage :—

2 cwt. superphosphate	per acre.
1 cwt. sulphate of potash	
1½ cwt. nitrolim or sulphate of ammonia	

OATS.

This cereal may be grown on almost any class of soil, but requires a fairly cool and moist climate.

When grown on a soil of average quality apply per acre from 3 to 5 cwt. of a mixed fertiliser containing from 6 to 8 per cent. water soluble phosphoric acid 8 per cent. of potash, and 4 to 5 per cent. nitrogen, or the following mixture :—

1½ to 3 cwt. superphosphate	per acre.
½ to 1 cwt. sulphate of potash	
½ to 1 cwt. nitrolim or sulphate of ammonia	

OLIVES.

This very hardy tree thrives on hard gravelly and stony soil, containing a fair amount of potash and lime, but does best on a fairly rich, well drained loamy soil in rather dry localities.

Young trees, before bearing, require a fertiliser containing more nitrogen than trees in full bearing. Young trees should receive every year—

1 lb. superphosphate	per tree.
½ lb. sulphate of potash	
½ lb. nitrolim	

older trees in full bearing require annually—

2 lb. bonedust	per tree.
1 lb. superphosphate	
1 lb. sulphate of potash	

The trees greatly benefit by an application of stable manure and ploughing under of green crops, and also by an occasional dressing with lime.

ONIONS.

A rich light sandy loam is most favourable, but even more clayey loams may be used if limed before cultivation. The soil should be friable and contain plenty of humus or decaying vegetable matter, and must be well drained.

Stable manure should not be used immediately before planting onions, but preferably the year before. An excess of nitrogenous manure may also be injurious to the crop.

Apply per acre, according to the class of soil—

4 to 7 cwt. superphosphate,
1½ to 2 cwt. sulphate of potash or muriate of potash,
1½ to 2½ cwt. nitrolim or sulphate of ammonia,

or the same amounts in lb. to every 43 square yards.

A mixed fertiliser, containing about 7 per cent. of soluble phosphoric acid, 8 per cent of potash and 4 per cent of nitrogen, may be used in quantities from 7 to 12 cwt. per acre, or from 7 to 12 lb. per 43 square yards.

ORANGES.

The general remarks made on the cultivation of citrus fruits, under the heading of "Lemons" apply to oranges and mandarins.

Several of the most favoured varieties of oranges and mandarins do remarkably well on our well-drained, rich volcanic scrub soils, others again, like for instance the Seville orange, can be grown on heavier soil than that most suitable to sweet oranges.

The application of artificial fertilisers is generally very profitable, and improves both quality and quantity of the fruit; the following facts, however, have to be borne in mind. Inorganic nitrogen, as nitrogen in form of sulphate of ammonia or of nitrolim, produces a light-coloured, thin-skinned sweet fruit, which is of more particular importance in the case of Navel oranges. Organic nitrogen, nitrogen in form of blood, meatworks manure, &c., produces oranges with darker and coarser skin. Potash produces also light-coloured and thin-skinned fruits, which are inclined to be acid.

An artificial mixed fertiliser, containing 8 per cent of nitrogen, in form of inorganic nitrogen, 4 per cent. water soluble phosphoric acid and 8 per cent of potash, should be applied at the rate 4 to 16 lb. per tree, in accordance with its age.

Any of the mixtures recommended for the manuring of lemons may be used, or the following may be found more suitable for oranges:—

2 to 6 lb. superphosphate
1 to 2 lb. sulphate of potash } per tree.
1 to 3 lb. nitrolim or sulphate of ammonia

or.

2 to 4 lb. bonedust
1 to 3 lb. superphosphate
1 to 2 lb. sulphate of potash } per tree.
2 to 4 lb. nitrate of lime

PARSNIPS.

This vegetable requires a rich sandy loam, which must be trenched or ploughed very deeply. An artificial fertiliser similar to the one given for carrots may be used, although the quantity of superphosphate may, with advantage, be slightly increased.

Apply per acre—

4 to 7 cwt. superphosphate;
¾ to 1½ cwt. sulphate of potash;
1½ to 2 cwt. nitrolim, or sulphate of ammonia

PASSION FRUIT.

This semi-tropical fruit thrives best on a warm, free loamy soil, but may be grown on poorer soils, with the aid of artificial fertilisers.

Use in accordance with the quality of the soil, a mixture of—

4 to 8 cwt. blood and bone manure
1 to 2 cwt. superphosphate } per acre.
1 to 2 cwt. sulphate of potash

A topdressing with 1 cwt. of nitrate of lime in spring will be found beneficial.

PASTURE.

Ordinary pasture can be very much improved by the application of artificial fertilisers. In the case of lawns the use of fertilisers becomes imperative, and they are best applied before lawns are topdressed.

Use, per acre, from 3 to 7 cwt. of a fertiliser, containing 4 to 5 per cent. of nitrogen, 6 to 7 per cent. of available phosphoric acid and 8 per cent. of potash.

A good mixture for lawns is the following :—

1 cwt. fine bonemeal 1 cwt. superphosphate 1 cwt. nitrate of lime 1 cwt. muriate of potash	per acre

or 4 lb. to 6 lb. of this mixture to every 43 square yards.

As a change the following mixture may be used alternatively :—

3 cwt. Thomas phosphate 1 cwt. sulphate of potash 1 cwt. dried blood	per acre.

PAPAW (PAWPAW).

This tree requires a well-drained soil, and does best on a good scrub soil all along our coast, in situations free from frost.

Apply, per acre, a mixture of—

2 cwt. bonedust
1 cwt. superphosphate
1 cwt. sulphate of potash
1 cwt. nitrolim

or 1 to 2 lb. of this mixture per tree.

PEACHES.

Peaches may be grown over a considerable part of our coastal and inland country, on almost any soil, from a light sandy loam to a heavy loam, with a clayey subsoil.

Apply, per tree, in accordance with its age—

½ to 3 lb. superphosphate ;
½ to 1½ lb. sulphate of potash ;
¼ to 1 lb. nitrolim or sulphate of ammonia,

giving young trees, not bearing, about one pound of the mixture, and large trees in full bearing up to 6 lb.

PEANUTS.

Peanuts do best on a fairly rich sandy loam, containing plenty of lime.

They may be grown between the rows in young orchard, and the leaves and stalk will give a valuable mulch.

Use a fertiliser containing 8 to 10 per cent. phosphoric acid, 10 per cent. potash and from 1 to 2 per cent. of nitrogen, in quantities up to 6 cwt. per acre, or the following mixture :—

2 to 3 cwt. superphosphate 1 to 1½ cwt. sulphate of potash 1 cwt. meatworks manure (with blood)	per acre.

PEARS.

This tree prefers a deep loamy soil, but does well on lighter soils. The manures recommended for apple trees should be used for this fruit also.

PEAS.

Peas may be grown on almost any kind of soil, but do best on a fairly rich, sandy loam. The fertilisers already recommended for Cowpeas and also for beans may be used for peas.

PERSIMMONS (DATE PLUMS).

This fruit tree may be grown in any fruit soil and does very well in our coastal districts south of the tropic of Capricorn.

To trees in full bearing apply every year—

- 2 lb. superphosphate
- 1 lb. sulphate of potash
- ¾ lb. nitrolim or sulphate of ammonia

per tree.

PINEAPPLES.

Pineapples are being grown in almost any kind of soil, all along our eastern seaboard. The most suitable soil is a light well-drained, sandy loam. Even in rather poor sandy soils, pineapples may be grown profitably with the aid of artificial fertilisers. All soils should contain a fair amount of humus and a sufficient quantity of lime. Soils inclined to become acid, due to defective drainage, are not suitable. All manuring experiments show the necessity of an ample supply of potash, and also that nitrogen is best applied in form of organic nitrogen (dried blood giving the best results).

Many old pineapple plantations would be greatly benefited by a heavy dressing of lime; air-slaked quick lime to be used in case of clayey soils, and carbonate of lime (shell sand, marble screenings, &c.) for sandy soils.

A mixed fertiliser containing from 6 to 8 per cent. phosphoric acid, 8 to 10 per cent of potash and 4 to 5 per cent. of nitrogen should be used at the rate of 6 to 15 cwt. per acre, according to the quality of land and age of the plantation. The manure should be applied in two dressings, and well dug, chipped or ploughed in as near to the rows as possible.

The following fertiliser mixtures may also be used with advantage:—

- 5 cwt. meatworks manure (blood and bone)
- 3 cwt. Thomas phosphate
- 3 cwt. sulphate of potash
- 1 cwt. dried blood or nitrate of lime

per acre;

for very young plantations the quantities to be reduced by one-half, and for very old plants the quantities to be increased.

PLUMS.

Plums may be grown in our coastal districts and also in the western country, on sandy loams and gravelly soils, with clayey subsoils.

Apply to a young tree in full bearing—

- 2 lb. superphosphate
- 1 lb. sulphate of potash
- ¾ lb. sulphate of ammonia or nitrolim

per tree.

For a very young tree the application can be cut down to one half of these quantities, and for very large old trees the amount can be safely doubled.

POTATOES.

This crop has an extremely wide range, and can be grown almost all over Queensland. Deep, friable, sandy loams, with porous subsoils are most suitable. Heavy soils, and wet, sour, clay soils, must be avoided. The soil should contain a fair amount of humus, and for this reason, potatoes do particularly well in virgin soils. The land must be cultivated deeply.

Well-rotted farmyard manure is one of the best fertilisers for potatoes, and if the heavy amounts (10 to 20 tons per acre) are not available, even small amounts used in connection with artificial fertilisers will be found very beneficial. Potash is the principal constituent of all potato fertilisers.

A complete fertiliser for potatoes should contain 6 to 8 per cent. soluble phosphoric acid, 10 per cent potash, and 3 per cent. of nitrogen, and should be used in accordance with the quality of the soil, in quantities from 5 to 10 cwt. per acre. It is often advisable to apply phosphoric acid and potash by itself, and the nitrogenous manure as a topdressing later on.

The following mixed fertiliser can be recommended :—

$$\left.\begin{array}{l}\text{2 to 4 cwt. superphosphate}\\ \text{1 to 2 cwt. sulphate of potash}\\ \text{1 to } 1\tfrac{1}{2} \text{ cwt. sulphate of ammonia, or nitrolim}\\ \qquad\qquad\text{or nitrate of lime}\end{array}\right\}\text{ per acre ;}$$

and if large amount of stable manure has been applied the amount of nitrogenous manure is cut down to one half of the above quantity, and applied as a topdressing at the time of blossoming, and in this case the quick-acting nitrate of lime is to be preferred.

In some cases muriate of potassium, or potassium chloride, gives better results than the sulphate.

PUMPKINS.

The manure recommended for marrows should be used for this crop.

QUINCE.

The fertilisers recommended for apples may be used for quinces.

RADISHES

Radishes require a light rich garden loam, and the crop may be forced with artificial fertilisers, containing 8 per cent. soluble phosphoric acid, 10 per cent potash and 3 per cent. nitrogen, used at the rate of 6 to 10 cwt. per acre, or 6 to 10 lb. per 43 square yard, or from 2 to 4 oz. per square yard.

The same manure as recommended for lettuce may be used.

RAPE.

Like mustard, rape is grown both as a forage crop and green manure crop, and the same fertiliser may be used.

SISAL HEMP.

Sisal hemp is generally grown on poorer classes of sandy and gravelly loams, which should contain, however, a fair amount of lime. Manuring with a fertiliser, containing 6 to 8 per cent. phosphoric acid, 8 per cent. potash and 3 per cent of nitrogen, at the rate of 3 to 6 cwt. per acre, may be necessary.

SORGHUM.

Use the fertiliser recommended for corn.

SPINACH.

The use of well-rotted farmyard manure at the rate of 10 to 12 tons per acre, or 2 to $2\frac{1}{2}$ cwt. for every 43 square yards, is particularly recommended. Lighter dressings of stable manure must be supplemented by artificial fertilisers.

Use, per acre, from 6 to 10 cwt. of a fertiliser containing 6 to 8 per cent. soluble phosphoric acid, 5 to 6 per cent. potash, and 2 per cent. of nitrogen, or use—

4 to 6 cwt. superphosphate
1 to $1\frac{1}{2}$ cwt. sulphate of potash
1 to 2 cwt. nitrolim or nitrate of lime
} per acre.

STRAWBERRIES.

Some of our coastal country, between the 26th and 28th degrees south latitude, is particularly suitable for strawberry culture, frequently producing quite phenomenal crops. Some of our rich loamy soils found in our coastal scrub lands give the best results. In poorer sandy soils the improvement effected by artificial fertilisers, particularly such containing potash, is very marked.

A complete fertiliser for strawberries should contain 7 to 8 per cent. phosphoric acid (water soluble), 8 to 10 per cent. of potash and 3 per cent. of nitrogen, and should be used at the rate of 5 to 9 cwt. per acre.

The following fertiliser mixture may be found useful:—

3 to 5 cwt. superphosphate
$1\frac{1}{2}$ to 2 cwt. sulphate of potash
1 to $1\frac{1}{2}$ cwt. sulphate of ammonia or nitrolim
} per acre;

or,

1 cwt. fine bonemeal
4 cwt. superphosphate
2 cwt. sulphate of potash
$1\frac{1}{2}$ cwt. nitrolim
} per acre.

SUGAR-CANE.

Sugar-cane is grown on almost any kind of soil on our coastal country, but gives the best returns on our alluvial soils and scrub soils, rich in humus. The same crop is generally grown continuously for a great number of years, and requires therefore proper fertilising with large amounts of artificial manures, in order to maintain the fertility of the land.

Exhausted sugar lands may be worked up again, after lying idle for a few years and allowing lantana to grow, which acts as a very valuable green manure crop, accumulating more particularly large amounts of potash.

A complete fertiliser for sugar-cane should contain about 7 to 8 per cent. each of water soluble phosphoric acid, potash and nitrogen, and should be used at the rate of 4 to 6 cwt. per acre.

The following manuring mixtures can be used, instead of the ready-mixed fertiliser :—

(1.) 2 to 3 cwt. superphosphate
1 cwt. sulphate of potash
2 cwt. nitrolim or sulphate of ammonia
} per acre.

(2.) 3 to 4 cwt. meatworks manure
1 to 1½ cwt. sulphate of potash
1½ cwt. nitrolim or sulphate of ammonia
} per acre.

(3.) 2 to 3 cwt. superphosphate
1 to 1½ cwt. sulphate of potash
1 cwt. nitrolim
1 cwt. nitrate of lime
} per acre,

the nitrate of lime to be applied as a topdressing.

SWEDES.

The fertilisers recommended for mangolds should be used for swedes.

SWEET POTATOES.

Sweet potatoes, require like the ordinary potato, a deep sandy loam, with a well-drained subsoil, and the same manurial treatment.

The same applies to other root crops, yams, arrowroot, &c.

TOBACCO.

This crop requires a light, sandy loam, containing a large amount of humus. As it is a very exhaustive crop, it must get a liberal supply of artificial fertilisers. The texture, aroma, and burning quality of the leaf is greatly influenced by the fertiliser used, and rank, coarse, organic manures, and also manures containing chlorides, like Kainit and muriate of potash, must be avoided.

An artificial fertiliser containing from 4 to 5 per cent. water or citrate soluble phosphoric acid, 5 per cent. of nitrogen, and 8 to 10 per cent. of potash (as sulphate) should be used in quantities from 6 to 10 cwt. per acre, and even such large amounts as 2,000 lb. of this mixture per acre have been found profitable in some of the tobacco countries.

The following fertiliser mixtures may also be used, increasing the amounts on poorer classes of soils :—

(1.) 1 to 2 cwt. superphosphate
1½ to 3 cwt. sulphate of potash
1 to 2 cwt. nitrate of lime or dried blood } per acre;

(2.) 2 to 3 cwt. Thomas phosphate
1½ to 3 cwt. sulphate of potash
1 to 2 cwt. nitrolim } per acre;

(3.) 1 to 2 cwt. superphosphate
1½ to 3 cwt. sulphate of potash
2 to 6 cwt. cotton-seed meal } per acre.

TOMATOES.

Tomatoes are frequently grown by orchardists, in their orchards before they come into bearing. The fact that tomatoes are very gross feeders, should never be lost sight of, and they undoubtedly impoverish the soil very rapidly, unless artificial fertilisers are supplied to the ground when planting.

Tomatoes do best on rich sandy loam, well drained and subsoiled. Use an artificial fertiliser containing 7 to 10 per cent. phosphoric acid, 8 per cent. potash and 4 per cent. nitrogen, and apply at the rate of 8 to 10 cwt. per acre, or 8 to 10 lb. per 43 square yards, or 3 to 4 oz. per square yard.

Complete fertilisers can also be made up as follows :—

4 to 5 cwt. superphosphate
1 to 2 cwt sulphate of potash
1 to 1½ cwt. nitrolim or sulphate of ammonia } per acre,

or,

3 cwt. fine bonedust
2 cwt. superphosphate
1½ cwt. sulphate of potash
2 cwt. nitrate of lime } per acre.

the nitrate of lime to be applied as topdressing in two lots, at beginning and during growing seasons.

TURNIPS.

Turnips, like beets, require a fairly rich, well-worked soil, and the same class of artificial fertiliser.

WATER MELONS.

Use the fertilisers recommended for cucumbers, or for marrows.

WHEAT.

Wheat may be grown on different classes of soil, and very large areas of country in Queensland are eminently suited for the culture of wheat. A clayey loam, with a fairly porous clayey subsoil, combined with a rather dry climate, gives the best results.

The demand for artificial fertilisers is only moderate, still light dressings with complete manures have given in many localities excellent results. In South Australia, the application of small amounts of superphosphate, ½ cwt. per acre, has increased the yield very considerably.

A complete fertiliser for wheat could be made up as follows :—

$\frac{1}{2}$ to $1\frac{1}{2}$ cwt. superphosphate
$\frac{1}{2}$ to 1 cwt. sulphate of potash
$\frac{1}{2}$ to 1 cwt. nitrate of lime or nitrolim } per acre,

or a fertiliser containing 7 to 8 per cent. water soluble phosphoric acid, 4 per cent of potash, and 3 to 4 per cent of nitrogen, may be used at the rate of 1 to 3 cwt. per acre.

CONCLUSION.

The artificial fertilisers enumerated as suitable for the various crops, supply the necessary amounts of the most important plantfoods— **Nitrogen, Potash,** and **Phosphoric acid.** The action of the manure must be considered as a direct and an indirect one. The direct action to supply the plant, and more particularly the young plants, before the root system is fully developed, with some of the **plantfoods** in an **easily available form,** is quite self-evident ; the indirect action which manures have by acting on the **animal life** and on the **bacterial flora** in the soil is more obscure, but quite as important. Each granule of soil is teaming with bacteria, some of which are highly beneficial, and absolutely necessary to the higher plants, and, others again, detrimental. On the predominance of one or the other class, plant life, and therefore, yield of crops is frequently depending. This explains the facts that **sterilisation** of soil by heat, or by addition of chemical compounds, has often proved very beneficial; again, the **inoculation** of soil with pure culture of beneficial bacteria, for instance, nitro-bacteria, has often given excellent results.

It frequently happens that small amounts of **other elements,** which are necessary to plant life or to bacterial flora, are absent, and, therefore, unexpected results have been obtained on the use of substances, not generally used as manures.

Iron sulphate (green vitriol) which in large amounts must be considered as plant poison, and can be used for the destruction of certain weeds, may be applied in small quantities ($\frac{1}{2}$ to 1 cwt. per acre) on many classes of soil with excellent results. Quite recently a French scientist discovered that on the application of **flowers of sulphur** (at the rate of about $\frac{1}{2}$ cwt. per acre) he about doubled the crop without the use of other fertilisers.

These few instances show the great value of experimenting, and it is quite probable that with our climatic conditions, similar results may be obtained.

As a conclusion, I will give the preparation of a **liquid manure** for the use of pot plants, ferns, orchids, &c. Dissolve in four gallons of water 2 oz. superphosphate, 1 oz. each of sulphate of potash and nitrate of lime. Some insoluble matter will settle, but does not interfere with the action of the manure. The pot plants may be immersed in the liquid for a few minutes, or can be sprinkled with the mixture.

A similar solution, only stronger, made by using same quantities dissolved in one or two gallons of water may be used for the forcing of vegetables, grass plots, &c. It is always better to water plants well after applying the liquid manure.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RECORD OF COWS FOR MONTH OF JULY, 1912.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Auntie ...	Ayrshire	4 July, 1912	1,151	3·8	48·73	
Lerida ...	,, ...	4 Mar. ,,	856	4·2	40·27	
Lady Margaret	,, ...	4 May ,,	668	4·3	32·21	
Burton's Lady	Shorthorn... ...	1 June ,,	643	4·1	29·48	
Lavinia's Pride	Ayrshire	23 Feb. ,,	625	4·2	29·04	
Lady Loch ..	,, ...	10 July ,,	654	3·8	27·68	
Davidina ...	,, ...	29 Dec., 1911	585	4·0	26·14	
Nellie II. ...	Shorthorn... ...	1 Feb., 1912	563	4·0	25·16	
Flora ...	Jersey	10 Feb. ,,	457	4·7	24·48	
Miss Heydon	Shorthorn... ...	3 Mar. ,,	530	4·0	23·69	
Laura ...	Ayrshire	6 Mar. ,,	464	3·9	20·19	
Mist ...	Holstein	20 Oct., 1911	494	4·0	20·06	

Cows fed on 40 lb. panicum ensilage daily.

COW CLUBS.

Most of our dairy herds are composed of well-bred cows and bulls, for which high prices have been paid, and any losses by drought, disease, or accident fall severely on the owner. Such losses could easily be recouped by a form of insurance, as is done in the case of other property of all kinds. In England and Wales there are what are called "cow clubs," dealing with the insurance of cows and calves only, and twenty-two co-operative societies having this object in view are registered under the Friendly Societies Act. The working of such a club is thus explained in the "Agricultural Gazette" (England) :—

A registered cattle insurance society must consist of at least seven persons, must have its rules passed by the registrar, must have its accounts annually audited and send a copy of them to the registrar, and must appoint one or more trustees in whom its property is vested. The rules are binding on the members, and sums payable to the society by members are recoverable in the county court. The 22 societies had, in 1910, 1,631 members, giving an average of 74 members per society; the smallest number of members was 12 and the largest 331. The societies insured altogether 4,588 cows and calves, or an average of 209 per society.

THE RATE OF MORTALITY.

Perhaps the most important question for an insurance society is the rate of mortality to be expected, says the Journal of the Board of Agriculture. Statistics on this point are available for seventeen of the twenty-two societies. Of the 4,243 animals insured by them, 94 died during the year—an average mortality of 2·2 per cent. per annum. (During 1911 the average mortality for 4,231 animals was 2·6 per cent.) Four societies insuring 133 cows had no deaths at all. For the societies insuring over 100 animals each the highest rates of mortality were—At Friskney, 3·8 per cent. for 104 animals; Hanmer, 2·9 for 1,178 animals; Wem, 2·7 for 256 animals; Prees, 2·6 for 585 animals; and Whixall, 1·8 per cent for 1,329 animals. This includes losses from disease or accident of any kind. Eleven of these seventeen societies insure cows only, a heifer being usually reckoned as a cow from the time she is bulled, at, say, from about twelve to fifteen months old. Six of the societies insure calves also, the general rule being not to insure calves under six months old, though one society insures them from three months old. Few societies have any rule against insuring cows above a fixed age, but one declines to admit cows over ten years of age or to pay a claim on a cow over fifteen. The average mortality of 3,548 cows for the two years 1910 and 1911 was 2·2 per cent. per annum; for 689 calves it was 3·7 per cent.

PAY AT DEATH.

The next point of importance is the amount the society will be called on to pay on the death of an insured animal. In the case of cows six clubs pay the full value at the time the cow fell ill, up to a maximum of £10; one has fixed the maximum at £9, another at £12, and another at £14. Three clubs pay only three-fourths of the value without limit; one pays four-fifths of the value, with a limit of £16. Most clubs have only one rate of premium for cows and one rule as to payment. Three clubs have three grades of premium and three corresponding grades of payment; for instance, one club pays the value up to £12, £10, or £8, according as the annual premium paid is 6s., 5s., or 4s. Where calves are insured, the amount payable on death is usually the value up to £5 or £3, or if the calf be under six or nine months old, a fixed sum of £2. The actual amount paid in 1910 on 49 cows was £504, an average of £10 6s. per cow; on 12 calves it was £51, an average of £4 5s. per calf; for the 94 cows and calves paid for in 13 societies taken together it was £822—an average of £8 15s. per animal. The full market value of 44 cows averaged £15.

According to that one year's experience, therefore, these thirteen societies may expect on the average to have to pay, under their rules, £8 15s. on 2.2 per cent. of the animals insured. To meet this loss would require a net income from premiums of 3s. 10d. per insured animal. As already stated, the actual sum realised in all twenty-two societies on 4,588 insured animals was £929, an average of 4s. 0½d. per animal; and the actual sum paid in losses was £983, an average of 4s. 3d. per insured animal, so that the total of premiums paid very nearly equalled the amount paid in claims in that year. Premiums are usually payable quarterly, the commonest rate for cows being in the larger societies 4s. per annum, but two societies

charge 5s. and 6s., and one as much as 8s. per annum. For calves the usual premium is 3s. per annum.

All the societies have a rule to the effect that if at any time the funds available are not sufficient to meet the claims, the members shall be liable to a special levy per insured animal to make up the deficiency; in some societies the amount so leviable at any one time is limited to 1s. per animal insured. Societies which have accumulated a considerable surplus are fairly secure against the risks of ever having to make such a levy; and, as a matter of fact, in 1910 only two societies did exact from their members an additional premium of this character, the extra rate in each case being 2s. per cow insured.

In addition to the quarterly premiums it is usual to charge an entrance-fee for each animal insured, the commonest rates being 6d., 1s., or 1s. 6d. per cow, and 6d. or 9d. per calf, but one society charges 7s. 6d. and another 15s. per cow on entry.

The hides and carcasses of insured animals that die generally belong to the society. They fetched on the average about £1 per animal.

Of these twenty-two cow insurance societies ten have been in existence for over fifty years; one, at Mawdesley, in Lancashire, was started more than a century ago, and still insures fifty-three cows at a premium of 6s. a year, pays £10 on each cow that dies from disease or accident, and has a reserve fund of £46, enough to pay four years' probable average losses.

EXPERIMENTS IN PIG-FEEDING.

GROUND *V.* UNGROUND GRAIN.

At the Central Experiment Farm of the Canadian Department of Agriculture some experiments have been carried out to compare the effects of feeding pigs with unground and ground grain respectively. The grains tried included oats, barley, maize, and a mixture of barley, oats, and peas. The unground grain was soaked for fifty-four hours before feeding. The pigs all belonged to two litters, and were as evenly graded in groups as possible.

A pen of four crossbred pigs, of an average weight of 97¼ lb., were fed on oats and skim milk. The quantity of unground oats consumed by this lot per lb. of increase in live weight was 4.21 lb., and of skim milk 3.45 lb. In order to find out what proportion of the grain passed through the animals undigested, the excrement was carefully collected for twenty-four hours, and washed. From 14 lb. of grain fed, 2 lb. 6 oz. of undigested oats were obtained, weighing 22½ lb. per bushel, and, when tested for vitality, 11 per cent. germinated. The average live weight of the pigs, when killed, was 170¼ lb.—a gain of 87 lb.

With the barley, four pigs, weighing 97¼ lb. each, were fed for twelve weeks on unground barley soaked in water for fifty-four hours, all they would eat, with 3 lb. of skim milk per day to each pig. It required 3.64 lb. of barley and 2.52 lb. of skim milk for each pound of increase in live weight.

From 17 lb. of barley fed in twenty-four hours, 2 lb. 2 oz. of undigested grain were separated, which, when dried, weighed 35 lb. to the bushel, but none of the kernels sprouted. The average gain in live weight was 100 lb.

UNGROUND PEAS RETURN.

Four pigs were fed for twelve weeks on unground peas soaked in cold water for fifty-four hours, as much as they would eat, with 3 lb. of skim milk per day to each pig. These pigs consumed 3.33 lb. of peas and 2.35 lb. of skim milk for each pound of increase. From 17 lb. of peas fed in twenty-four hours, only 2 oz. of undigested grain were separated. The average increase in live weight was 107 lb.

Three pigs, of a live weight of 72 lb., were fed for thirteen weeks on unground Indian corn, soaked for fifty-four hours, with 3 lb. of skim milk per day to each pig. They consumed 2.90 lb. of corn and 2.31 lb. of skim milk for each pound of increase. From 11 lb. of corn fed during twenty-four hours, there were separated 8 oz. of undigested grain, which, when dried, weighed 40¼ lb. per bushel. The average increase in live weight in this lot amounted to 118 lb. each.

Three swine were fed for thirteen weeks on a mixture of equal parts of unground oats, barley, and peas, with 3 lb. of skim milk per day to each pig. They consumed 3.20 lb. of this mixed grain, and 2.60 lb. of skim milk, for each pound of increase. In this lot the average live weight gain was 103 lb.

The increase in live weight was found to be greatest in the lot fed with maize, and these pigs also showed the least shrinkage in dressed weight.

FEEDING WITH GROUND GRAIN.

Further experiments were made with feeding with ground grain, soaked and dry, the meal being composed of equal parts of oats, barley, and peas, with a half-part of bran. To one pen this meal was fed after it had been soaked for thirty hours in cold water; in the other case it was fed dry, and a tub introduced into the pen with cold water, so that the pigs could drink as often as they desired. Each pig was given 3 lb. of skim milk per day, as in the other tests, and all they could consume of soaked meal in the one case and of dry meal in the other. These pigs were from the same litter, and they weighed about 100 lb. each at the start, there being a difference of only 4 lb. in the total weight of each pen.

The four pigs fed on meal soaked made 1 lb. of increase in live weight on a consumption of 4.69 lb. of meal and 3.61 lb. of skim milk, whereas the four pigs fed on the same meal dry made 1 lb. of increase from 4.19 lb. of meal and 3.20 of skim milk. Those fed with dry food made 34 lb. less weight in the same time to the pen, and they consumed 316 lb. less of grain. So that it appears from this experiment that it is more economical to feed meal dry. One lot of four pigs weighed 407 lb., and the other lot of four a total of 403 lb. At the close of the test the first lot weighed 756 lb., and the second lot 718 lb. Those that were fed on the moist feed did not do so well as those that were fed on the dry food until the last four or five

weeks of the feeding period. In the meantime they had grown a little more "rangy," and during this latter period they put on weight more rapidly than those fed on dry meal, but there was more shrinkage when they were killed. Those fed on dry grain were shorter, more solid and compact, and they made, on the whole, more flesh with the consumption of less grain.

The live weight of the first lot fed on soaked meal, fasting fourteen hours, was 743 lb.; and the dressed weight, twenty-four hours after killing, was 540 lb. In the other case, where the pigs were fed on dry meal, the live weight, fasting fourteen hours, was 690 lb.; and twenty-four hours after killing, it was 545 lb. There was nearly 50 lb. less shrinkage with those fed dry. The results of these experiments are held by the director of the Dominion Experiment Farm to show that, on the whole, the advantage was with the meal as against the unground grain.

The Central Experiment Farm, Ottawa, has carried out a series of pig-feeding experiments, and the conclusions arrived at have been as follow:—

1. It will not pay to cook feed for swine where economy of pork production is the sole consideration.

2. There is a gradual increase in the quantity of feed consumed for every pound of gain in live weight after the average live weight exceeds 100 lb.

3. The most economical time to slaughter swine is when they weigh from 175 to 200 lb.

4. The greatest and most economical gains are made when the swine are able to eat the most feed in proportion to their weight.

5. Frozen wheat may be used as a profitable feed for swine.

6. Skim milk adds most materially to the value of a grain ration, and 100 lb. mixed grains equal 700 lb. of skim milk. The relative value of skim milk in any ration varies with the amount fed, the poorest return per lb. fed being obtained when the proportion of skim milk in the total feed is the greatest.

7. The average dressed weight of swine is about 76.44 per cent. of the fasted weight.

8. Skim milk is a most valuable adjunct to the grain ration when hard flesh is desired.

9. Type of animals fed influences character of meat more than breed—*i.e.*, the fact of an animal being a Yorkshire or a Tamworth will not ensure a good bacon carcass, but they must also be of a "rangy" type, and fed in a certain way.

10. Feeding mixed meal (barley, peas, and oats) with milk usually ensures firm meat.

11. The greatest gains from a given amount of grain appear to be made when it is ground and soaked for twenty-four hours. Part of the grain fed whole is frequently voided before being digested.

12. Mixed grains are more economical than grains fed pure.

13. Pigs whose rations are limited make, on the whole, more economical gains than pigs that are rushed.

14. Maturity or ripeness of the animal affects the quality of the flesh. Some of the more advanced pigbreeders regularly supply their hogs with condition powder. This is made with, say, 6 bushels pulverised charcoal, placed in a shallow box or on the floor; add $1\frac{1}{2}$ bushels of hardwood ashes and 6 lb. of salt. Mix these thoroughly. Dissolve $1\frac{1}{4}$ lb. copperas (sulphate of iron) in 3 galls. of hot water; sprinkle this on the above through a watering pot, stirring and mixing the whole while slowly sprinkling. Then place the whole, or a good portion, in a self-feeding box.

TEETH OF YOUNG PIGS.

Should the sow carry her pigs beyond the usual period of gestation, it frequently happens that the piglings' teeth will have made an abnormal growth, and, in some instances, the teeth will have become discoloured to an extent which has led to the common saying that "pigs born with black teeth never do well." These little teeth are often very long and sharp, so that, when the little pigs attempt to suck, the teeth extend beyond the tongue of the pig and prick the inflamed and tender udder of the sow, giving her great pain, which frequently causes her to refuse to suckle the pigs, and sometimes she will attack the little ones with open mouth, when one grab from her powerful jaws seriously injures if it does not at once kill the youngster. Unless immediate steps are taken to remove the cause of the trouble, the pigs soon die for want of food, and the sow's udder becomes distended with milk, and inflammation of it follows.

THE REMEDY.

This is simple and easily applied by the attendant on the sow. He takes up each pig, tucks it under his left arm, opens its mouth with his left hand, and with his right hand and a small pair of pincers he breaks off the erring teeth, and places the pig to the sow. Then by a little coaxing and scratching, the sow will turn on her side; the little pigs, being unable to bite the udder, and each other, will quickly relieve the distended udder of the sow, and prove a source of pleasure to her instead of an irritant and a cause of pain.

Sometimes the sow will become impatient on hearing the shrieks of her little pigs while the operation of dentistry is progressing; if this does affect her, it is best to take the little pigs into an adjoining place out of hearing of the sow.

When a sow is so careful of her pigs that she never lies down without knowing they are safe from being crushed, keep her until she is six years old. She is worth a fortune. Send the nervous, fidgety sow to the butcher; she is not a good mother.

There is a wonderful difference in sows in caring for pigs and in handling at farrowing time. Any brood sow ought to be so quiet, and so well acquainted with her feeder, that she will let him pick up her pigs without much protest.

Poultry.

REPORT ON EGG LAYING COMPETITION, Q.A. COLLEGE, JULY, 1912.

Three thousand one hundred and forty-six eggs were laid during the month—an average of 104.8 per pen. All the birds are now doing well, with the exception of Mr. Padman's: these have just gone through a complete moult: they will, however, soon be laying again. The pens owned by Mr. Cornish and Mrs. Craig have also been unfortunate, every bird having moulted. The great feature in the laying this month is the splendid score put up by the Black Orpingtons, which win the monthly prize with 164 eggs. The following are the individual records:—

Competitors.	Breed.	July.	Total.
J. Gosley	White Leghorns	128	407
R. Burns	Black Orpingtons	164	386
A. T. Coomber	White Leghorns	124	373
A. R. Wooley	Do.	130	368
Tom Fanning	Do.	134	356
Range Poultry Farm	Do. (No. 1)	126	349
E. A. Smith	Do. (No. 2)	125	343
H. Tappenden	Do.	132	338
E. A. Smith	Do. (No. 1)	112	321
W. D. Bradburne, N.S.W.	Do.	85	312
Mrs. Beiber	Brown Leghorns	97	300
R. Burns	S.L. Wyandottes	127	297
J. R. Wilson	White Leghorns	144	295
Cowan Bros., N.S.W.	Do.	107	290
Yangarella Poultry Farm	Do.	131	288
B. Holtorf	Do.	85	257
J. Zahl	Do. (No. 1)	140	252
Mrs. Sprengel	Do.	130	243
A. H. Padman, S.A.	Do.	0	223
J. Holmes	Do.	95	220
J. F. Dalrymple, N.S.W.	Do.	87	200
Range Poultry Farm	Do. (No. 2)	121	200
H. Hammill, N.S.W.	Do.	95	200
J. Zahl	Do. (No. 2)	125	184
Mrs. Dredge	Do.	31	182
W. W. Hay	Black Leghorns	75	158
D. Grant	White Leghorns	111	154
F. G. Cornish	Do.	55	117
R. Burns	Do.	72	105
Mrs. Craig	Do.	60	75
Total		3,146	7,793

ON DOCTORING FOWLS.

Many people pride themselves on the successful doctoring of their sick fowls. Is it worth while to waste time over remedies which may effect a cure of some particular disease, but which leave a bird in no condition to afterwards breed from ? This is what " Farm and Home " says about it :—

" Don't make the mistake of doctoring sick chickens. Most always you will fail to cure ; you will waste time that could be better employed on the well birds ; and, even if you succeed, the weakness will always be there. In the general run of things, you will breed from one of these cured birds later on, and then you will find the particular weakness considerably intensified. The doctoring habit grows. It is a fearsome thing, and the man who gets it bad is apt to become a pest to his family. He soon begins to think that Jacky isn't ' looking quite the thing,' and so poor Jacky gets a dose of something or other put under his little waistcoat. Writer has seen (and dodged with great speed and earnestness) some of these doctoring chaps. From every point of view, the proper way to deal with sick chickens is to kill them out of hand."

" Farm and Home " also gives good advice as to

THE BREED FOR THE FARMER.

" The breed that succeeds in finding a place in the affections of the farmer is the one that possesses hardiness, egg-production and market quality. Ornamental breeds may do for the showroom, but they will exist in limited numbers only, while the less gaudy but useful breeds will be scattered far and wide over the country as producers of eggs and chicks. There is no reason why the useful bird should not be beautiful also, but its beauty should not take the precedence. Some of our established breeds have stood the test of years, and are as popular to-day as ever, while each year witnesses something new added to the list, as there is no limit to improvement and advancement."

A MANGO CANNERY.

A plant to can mangoes, litchis, pineapples, &c., has recently been erected at Muzaffarpur, about 350 miles from Calcutta, on the East Indian Railway. It is said the canning methods are identical with those employed in California in the canning of freestone peaches; mangoes are merely peeled and the pulp then sliced from the seed. Here in the Philippines, where we have practically fibreless mangoes, this industry should be a much simpler process, as far as removing the pulp from the seed goes; and, furthermore, the quality of the canned article would certainly be superior, since the great objection to sliced mangoes is, of course, the "fibrousness."

Hence, if the cannery in India is a success, it should be a still better proposition here in the Phillipines, once the mango industry is established—that is, once we can boast of a modern orchard of mango-trees, every individual of which bears a full crop at least once every twelve months. The Carabao variety would leave little to be desired by the cannery man.—"Philippine Agricultural Review."

State Farms.

WARREN STATE FARM.

Mr. T. Jones, Manager of the Warren State Farm, sends the following cheering statement concerning operations there :—

This farm is situated on the Queensland Central Railway, 18 miles to the west of Rockhampton. Neerkol Creek, with its never-failing supply of water, runs through the farm, as do also Sandy and Stony Creeks, these latter only containing water in flood time. The land is for the most part level.

The area of the farm is 1,128 acres. The buildings consist of Manager's residence, men's quarters, implement-shed, stables (fourteen stalls and loose box), milking-shed, calfpens, boiler-house for pigs, pigsties, and a reinforced concrete silo.

There are 95 acres under cultivation at present. Four acres are under fruit-trees, including mandarins, oranges, lemons, citrons, and olives ; one acre is under grapes, which did very well last season.

One of the chief objects of the farm is the experimenting with grasses in order to improve the carrying capacity of the land. This has been done successfully by cultivating roughly between the trees and planting Rhodes grass. The land handled in this way is a piece of clay box flat adjoining the railway, and the appearance of it throughout the recent drought has been responsible for some hundreds of acres of Rhodes grass being planted in Central Queensland ; inquiries are received from all parts of the Commonwealth, and even from America, regarding the qualities of this grass.

Many other grasses have been experimented with in small plots, but none of them survive the climatic conditions of this locality like Rhodes grass. Clovers will not thrive here, and grasses which are only annuals are soon smothered by some useless native grasses in good growing seasons.

The carrying capacity of the land has been improved by about 600 per cent. since the introduction of Rhodes grass.

When the farm was taken over by the Government it was rather badly infested with prickly pear, and the creek flats were full of nut grass. The eradication of the pear is almost completed, and our experiments have taught us that the nutgrass can be completely smothered by planting the land with giant couch grass (*Panicum muticum*). This grass makes a good rough hay, and yields a large quantity of green feed and silage.

Crops.—The richest of the land is being put gradually under lucerne, which thrives well on the small alluvial portions along the creeks. Several varieties of lucerne seed have been tried, but the best results have been obtained from the Darling Downs seed.

Wheat.—Milling wheats do not mature properly at Warren, owing to rust, but the Macaroni varieties do very well. Some splendid yields of hay have been grown, one crop of Cretan going over 4 tons to the acre. Medeah is also a suitable wheat for Warren; in fact, all the bearded varieties planted have done well.

Barley.—This crop grows well in fair seasons, but is only used as green fodder and pig feed, there being no market here for the grain.

Oats.—It is seldom that we can grow a good crop of oats, rust being so prevalent in the district.

Rye.—This grows very well, and is found a useful crop for green feed and hay, being always free from rust.

Canary Seed.—This is the most valuable of the winter crops at Warren. It stands the weather well, always yields a heavy clean crop of hay, is cheap to plant, and is very marketable as chaff either by itself or mixed with lucerne

Summer Crops.—Sorghums and millets grow exceptionally well here. The most suitable of the sorghums has been *Sorghum saccharatum* (or black-seeded), and the best of the millets, Brown Jap, German, and Manchurian. the latter being very prolific. (*See* "Agricultural Journal," Vol. II.)

Maize.—Several varieties have been tried and Early Leaming has proved the most suitable. It yielded over 100 bushels to the acre in 1910. Quick-maturing varieties have not yet proved successful at Warren.

Pumpkins.—There are few crops which give a better return from as little outlay as pumpkins in this district. All classes of pumpkins, marrows, melons, squashes, &c., thrive well here.

Rice.—A trial plot of this crop was planted this year. (*See* "Agricultural Journal" for May, 1912.)

Cowpeas.—A great number of varieties have been tried, and the most vigorous grower is Groit, but the most suitable for hay is Poona.

Ensilage.—No special crops have yet been grown for ensilage, but the silo has been filled three times with the waste products of the farm. These are: Lucerne in wet weather, cereals when first attacked with rust, maize when cobs are not forming well, and sorghums when not required as green fodder.

Live Stock.—Studs of Clydesdale horses, Ayrshire cattle, and Berkshire pigs are kept. The success of the stock at the show has aroused a keen demand for Warren stock; and, satisfaction being always given, the demand is maintained. The Clydesdale colts are eagerly sought after. The Ayrshire stud would be difficult to outclass, members of which are now well distributed in the State, and the demand far exceeds the supply. The same can be said of the pigs, which are of a very high class. Only first-class male stock are distributed to breeders.

EXHIBITS AT THE EXHIBITION.

In a country of which so great a portion is devoted to agricultural, pastoral and other rural pursuits, much interest is centred in exhibits of their produce both at local and central exhibitions, and amongst the attractions of the Agricultural Section of the Annual Queensland National Association's Exhibition, the courts of the Agricultural College and State Farms are generally conceded to be amongst the most interesting and attractive exhibits from an agricultural point of view, and they deservedly attract crowds of appreciative visitors. All the more interesting and valuable are these exhibits, when it is considered that they enable the vistor to pass in review the products of the tropical, subtropical, and temperate climates of a thousand miles of coast line, and over an area of 100,000 square miles of the cultivated and settled portions of the State. Such a panoramic exhibition of the products of these different climates would be impossible in any other State of the Commonwealth, possibly in any other country in the world, if the exhibition were, as here, confined purely to the products of the State.

However excellent may be the various products shown, it is yet possible to fail to impress their significance on the general public by a neglect of the science of making a display, and the art of arranging a court to display the exhibits to the best advantage is one demanding a long apprenticeship, and it is just here that the managers of the institutions named excel as past masters in the work, owing to their having so often exhibited for years past, not only in Brisbane, but a large number of country shows. Taking the departmental exhibits right through, they are full of interest, and not only to agriculturists, orchardists, pastoralists, horticulturists, and generally to all primary producers, but also to scientists and to those who are now arriving from the old country and from the Southern States with the view of settling down amongst us as farmers and graziers, or of investing capital in some of the many profitable industries which the acknowledged vast resources of the State present to them.

Last year a visit was paid to Queensland by several members of a Scottish Commission on the resources of the Australian States and Tasmania, and the impression left on their minds, as well as on all our outside visitors, after an inspection of a large portion of the State, including our State Farms, our Agricultural College, and our Tropical Nursery at Kamerunga, in North Queensland, and of the various products of the State at the Exhibition, was that in no other portion of the British Empire could these collective exhibits be equalled, and certainly not surpassed.

To take the departmental exhibits in detail, we will first consider those of

PLATE 25.—OFFICIAL OPENING N. A. AND I. ASSOCIATION'S SHOW, BOWEN PARK, BRISBANE, 1912.

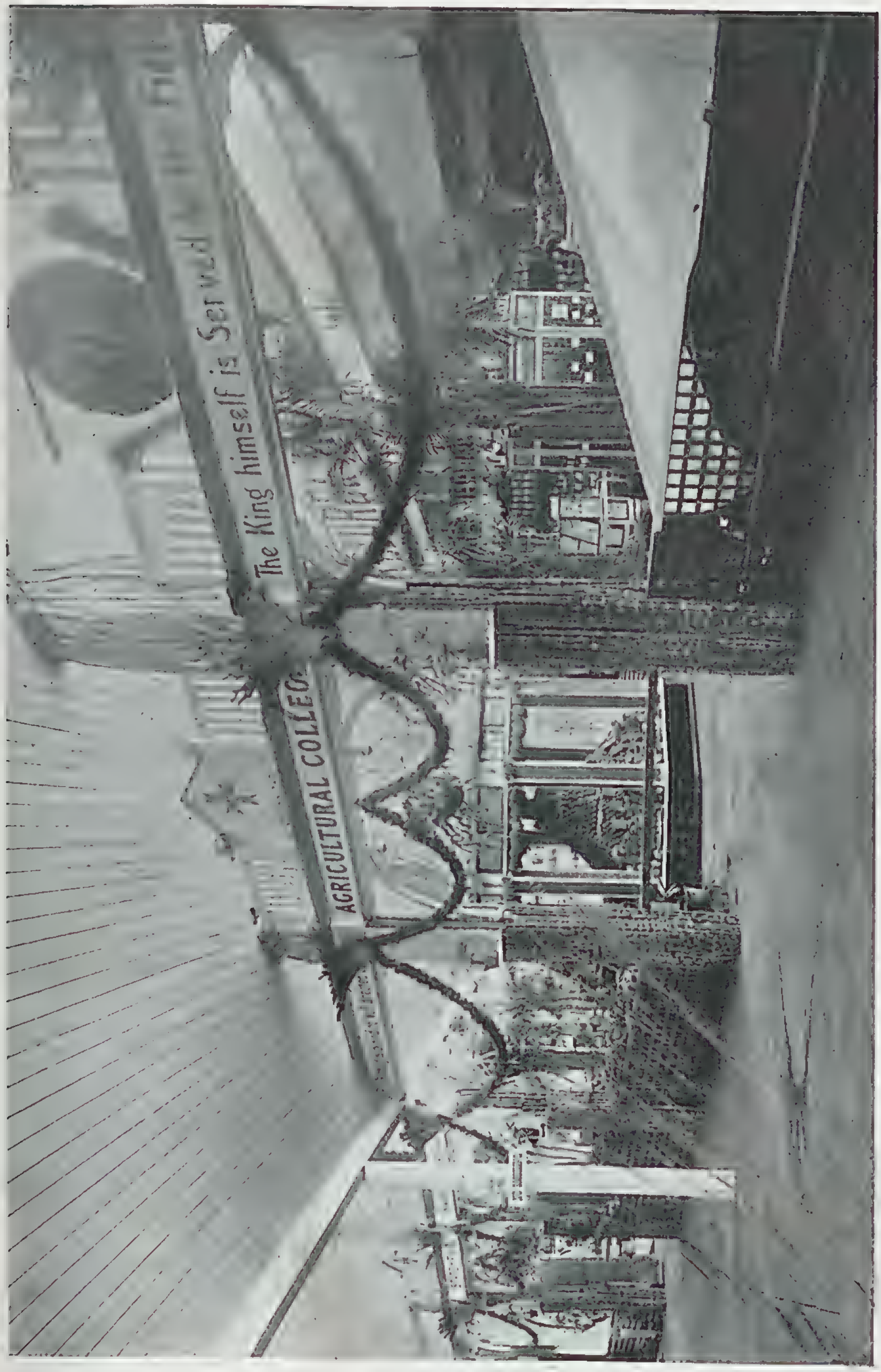


PLATE 26.—FRONT OF DEPARTMENT OF AGRICULTURE'S COURT, BRISBANE SHOW, BOWEN PARK, 1912.

THE QUEENSLAND AGRICULTURAL COLLEGE.

These are strikingly varied, and, largely owing to a succession of splendid seasons and mainly to excellent management, are equal to, if they do not surpass, those of 1911.

The Gatton College, as its name implies, is an establishment some 65 miles from Brisbane, where from sixty to seventy resident students are instructed, not only in agriculture, stock-breeding, and dairying, but they also go through a course during their three years' term at the College which comprises veterinary science, chemistry, surveying, carpentering, blacksmithing, and other mechanical arts, and it is worthy of note that 90 per cent. of the students, on leaving the institution, take up some form of rural industry, and many obtain good appointments as dairy and stock inspectors, managers of butter factories, &c. Thus, although neither the College nor the State Farms are self-supporting, they do permanent good work in the general instruction of those who open up the land, and establish permanent industries, which indirectly benefit the State and the general community

The College exhibits this year comprise various kinds of grain, fodder, green and dry, and in the form of silage. In the dairy section there are exhibits of butter and cheese in various forms—Cheddar, potted and fancy varieties—and, as adjunct to dairy products, bacon in flitches and rolled—all prepared by the students, of course, under expert supervision.

Garden produce is excellently displayed in the favourite pyramid fashion. There is also a cotton pyramid, as at last year's display. Cotton does well at the College, but, of course, it is only grown experimentally. The ginned cotton is of very fine quality, and, at present quotations, would readily bring 7d. per lb., or even more. Indian cane is also shown. This cane has proved itself one of the finest fodders for stock, far superior to Mazzagua, a frost-resister, and a heavy yielder. The College authorities say that too much cannot be said of it as a most valuable crop for the dairy farm. Next we come to a trophy of stack silage. A stack, 30 ft. by 14 ft., and 14 ft. high, was built between uprights, and consisted of the following materials:—Green maize, frosted maize, amber cane (5-ft. ratoons)—which latter gave 5 tons per acre—plant cane—8 tons—and Japanese millet. The stack was covered with bush hay and weighted with earth. It solidified to 7 ft. in height, and contained 54 tons of silage, the waste being barely 6 in. deep on the outside of the stack. At the base of the pyramid are samples of silage from different materials made in pit silos, silos of reinforced concrete, of fibro-cement and iron. These silos carry from 60 (iron) to 130 tons (fibro-cement). Other exhibits are cereals, fodder grasses, roots, pumpkins, honey, wax, saddlery, and carpentry work by students. Finally, there are various kinds of seeds, and a trophy of small bales of hay, and several kinds of dry fodder. The whole exhibit is divided into four sections, consisting respectively of Agriculture, Dairying, Horticulture, and Cotton.

The live stock exhibited by the College includes cattle, pigs, and horses of various breeds, as well as poultry.

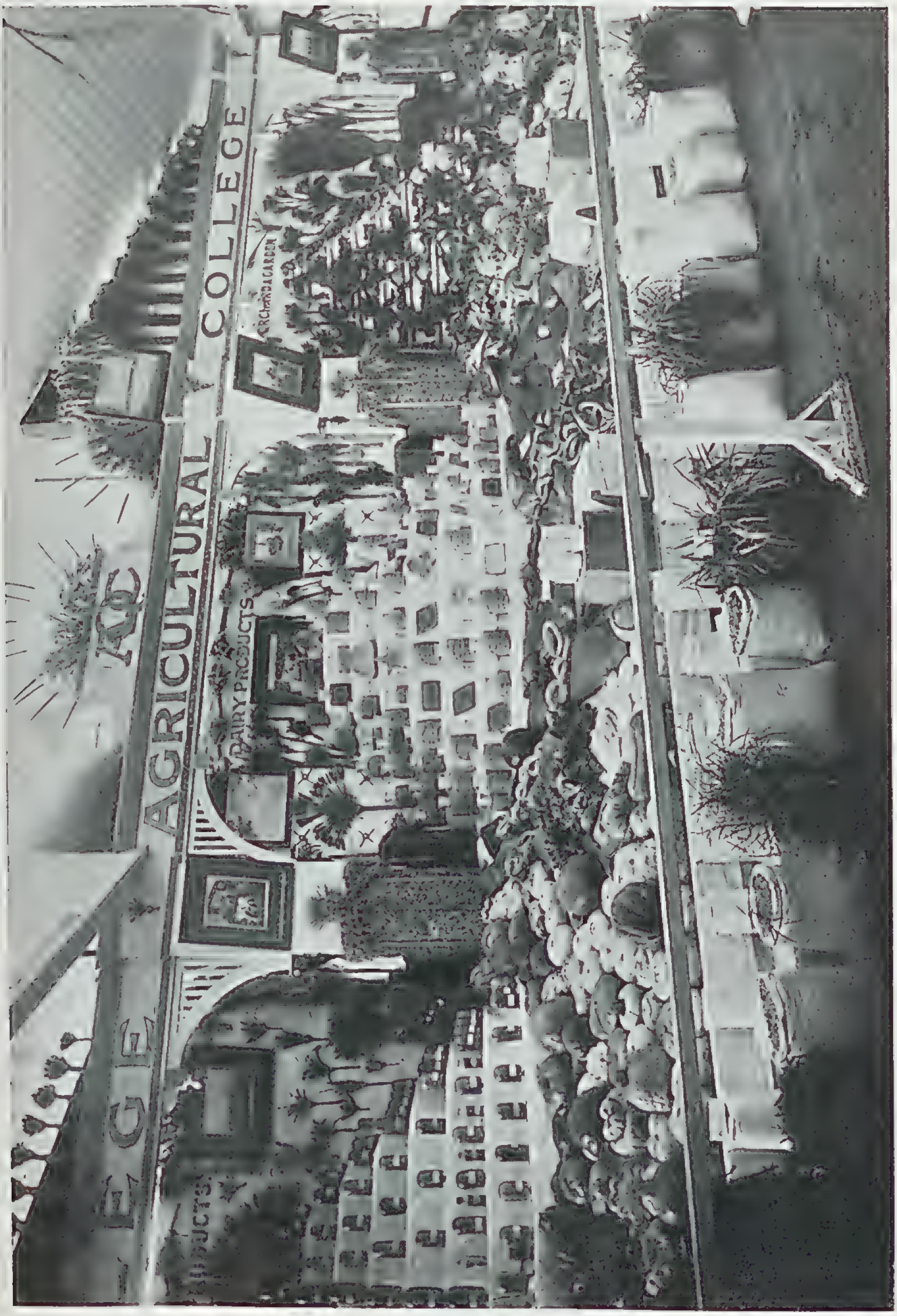


PLATE 27.—QUEENSLAND AGRICULTURAL COLLEGE EXHIBIT, BRISBANE SHOW, BOWEN PARK, 1912.

STATE FARM EXHIBITS.

The State Farm sections occupy a considerable space near the upper entrance to the grounds, and are contiguous. This year the only farms in evidence are the Hermitage, near Warwick, and the Roma State Farm, Bungeworgorai, together with the Kamerunga State Nursery, which latter, owing to its exhibits of tropical products, which will in the near future form important items of export, always attract well-deserved attention.

Each farm has a specialty in respect to products, although, generally speaking, the Southern farms exhibit many similar products.

ROMA STATE FARM.

BUNGEWORGORAI,

better known as the Roma State Farm, is, it may be said, the most important of these institutions, since it is here that special work is carried out in the matter of improving our wheats by cross-fertilisation. It is one of the peculiarities of the Queensland climate that it necessitates the production of wheats suitable to different localities, and it is with this object that the work of hybridising is being carried on at the Roma State Farm by the manager, who is an expert at this work.

Mendel's theory with regard to the laws of heredity (or Mendelism) is being closely followed throughout the work, and much valuable knowledge of this theory has been gained, clearly demonstrating its correctness in the sameness of the characteristics observed here when compared with those elsewhere. Last year it was stated that the report on the work then proceeding could not be completed till 1912. Readers of the *Queensland Agricultural Journal,* issued by the Department of Agriculture and Stock, who are interested in wheat culture will, ere this, have obtained full particulars of the results, which have been published in that journal.

The following short resumé of the work at Bungeworgorai will serve to show what has been so far done in the way of producing desirable wheats, the characteristics of which are—heavy yield, immunity to rust, and to some extent drought-resistant.

The exhibit from this farm includes cereals, fruits, and fodders.

Wheat culture is the chief work carried out, and some of the samples exhibited demonstrate that this crop can be grown successfully even in seasons of very light rainfall, the yields last season in some instances reaching 28.6 bushels, though the rainfall from April to 14th October was only 3.73 in.

With this crop, as with others, the work is purely of an experimental nature, there being twenty blocks devoted to testing of different methods of cultivation rotation cropping. The manurial experiments, which are fairly complete, necessitate the laying out each season of twenty-three plots on two classes of soil. This work has already borne fruit, as it has been proved conclusively that manuring pays handsomely and farmers are now taking it up on the lighter soils.

PLATE 28.—STATE FARMS AND GRAIN EXPERIMENT EXHIBITS, BRISBANE SHOW, BOWEN PARK, 1912.

To find out the susceptibility to smut of the chief varieties grown in the district and at the farm necessitated the sowing of thirty-two varieties, and the testing of the various smut preventatives and the danger of reinfestation in each has been continued with this season.

The raising of new varieties forms no small portion of the work.

Screens illustrating the results of cross-breeding with this crop, as well as cow-pea crosses, are shown.

The fruit-growing is confined chiefly to the testing of varieties, though different methods of pruning and manurial experiments are being tried.

The citrus fruits comprise the following:—

Lemons, which have done remarkably well, two varieties, 376 trees.

Oranges in most instances have done well, four varieties, thirty-six trees.

Mandarins, with one or two exceptions, have been successful, seven varieties, twenty trees.

Of the stone fruits the apricots have proved the most remunerative, though all made vigorous growth.

A number of varieties of vines, both wine and table, have been tested, some of which undoubtedly will be of value to the growers in the future.

Ten varieties of olives are being tried. The trees, which number 100, are planted on either side of the front drive and have done remarkably well.

The testing of all fodder crops worthy of notice has been entered into on a small scale and the following have been grown successfully:—Cowpeas, rape, sorghums, and panicums. Of the grasses tried the one which stands out above the other is Rhodes, and evidently the most suitable for the Western portions of the State.

An Ayrshire herd is also attached to the institution, and the service of the bull, which is an imported animal, is available to the farmers at a reasonable figure.

For the conserving of fodder for these, two silos have been erected. one being of reinforced concrete, and the other galvanised iron lined, their capacity being 110 and 60 tons respectively.

The work of cross-breeding, previously mentioned in connection with wheat, has also been entered into with other crops, such as cowpeas, sorghums, &c. It is by this and selection that it is hoped to produce crops having the characteristics which will enable the farming community to sow with less likelihood of their not getting the maximum results from their labour than is at present the case.

HERMITAGE STATE FARM.

This, one of the oldest established State Farms in the State, has for many years proved of great value to new settlers on the Downs. It has done its work faithfully, and those who have so much benefited by the lessons derived from it have now no more need for it, and as soon as the wheat harvest is over it will close its career of usefulness.

As usual at many Exhibitions, the exhibits from the Hermitage consist mainly of farm crops, and are very varied in character. These consist of forage crops, such as oaten hay, Rhodes grass, sweet grass (*Chloris virgata*), lucerne, and Phalaris or Canary grass. Amongst the vegetables are fine specimens of Brown Spanish and Yellow Globe onions, turnips, kohl-rabi, leeks, table and cattle pumpkins, several varieties of sorghums, millets, and cowpeas. Wheat of many improved varieties is also in evidence, besides maize, barley, oats, and many introduced grasses, together with a great variety of market garden produce, which go to prove the excellence of the rich soils in the neighbourhood of Warwick. All these products are arranged in a tasteful manner, and visitors, particularly new arrivals on the Downs, who have lately entered upon rural life, cannot get a better object lesson and insight into their future prospects than by visiting this interesting exhibit.

The Hermitage has also been for some years the home of a valuable breed of merino sheep, presented to the Department by Mr. Slade, of Glengallan. These sheep have, like all Darling Downs flocks, thriven admirably and their wool, as shown at successive exhibitions, has always been approved by experts in the wool trade.

STATE NURSERY, KAMERUNGA.

From the view point of the tropical agriculturist, the annual exhibits of this tropical garden are amongst the most interesting exhibits at the Exhibition. Of course there are many products of the Queensland soil which come under the head of " tropical," but many of them, such as pineapples, mangoes, cassava, yams, many fibres and spices, thrive as well in temperate climates of the State as in their more natural warm, Northern climate. But there are some which can only be produced successfully from a commercial point of view in the torrid zone, and it is more particularly with a view to instructing planters and others in the Far North in the best methods of producing these economically that the Tropical Nursery was established. Hence, this section of the department's exhibits forms an exhibition of itself. Our visitors and our settlers from the South know practically nothing about the economic value of such products as are here to be seen. Even to the majority of Queensland farmers, sugar growers, and others in the Tropical North, the production of rubber is a sealed book. Now here we have the whole history of rubber unfolded to us from the seed to the final commercial article, the entire process being clearly explained. An interesting collection of the singular so-called knives used in tapping rubber trees, with cups for the collection of latex, serves to show how the latex (or milk) is extracted; and other appliances are there which indicate how the latex is finally converted into marketable rubber. Besides rubber, there is cotton, which is of such enormous importance to pretty well all the inhabitants of the world for clothing purposes, and which can be produced in many suitable districts in Queensland. Vanilla, again, is another product few are acquainted with except in its manufactured state as it is used in essences, soaps, &c. Here we may see the beautiful

PLATE 29.—KAMERUNGA (CAIRNS) TROPICAL STATE NURSERY EXHIBIT, BRISBANE SHOW, BOWEN PARK, 1912.

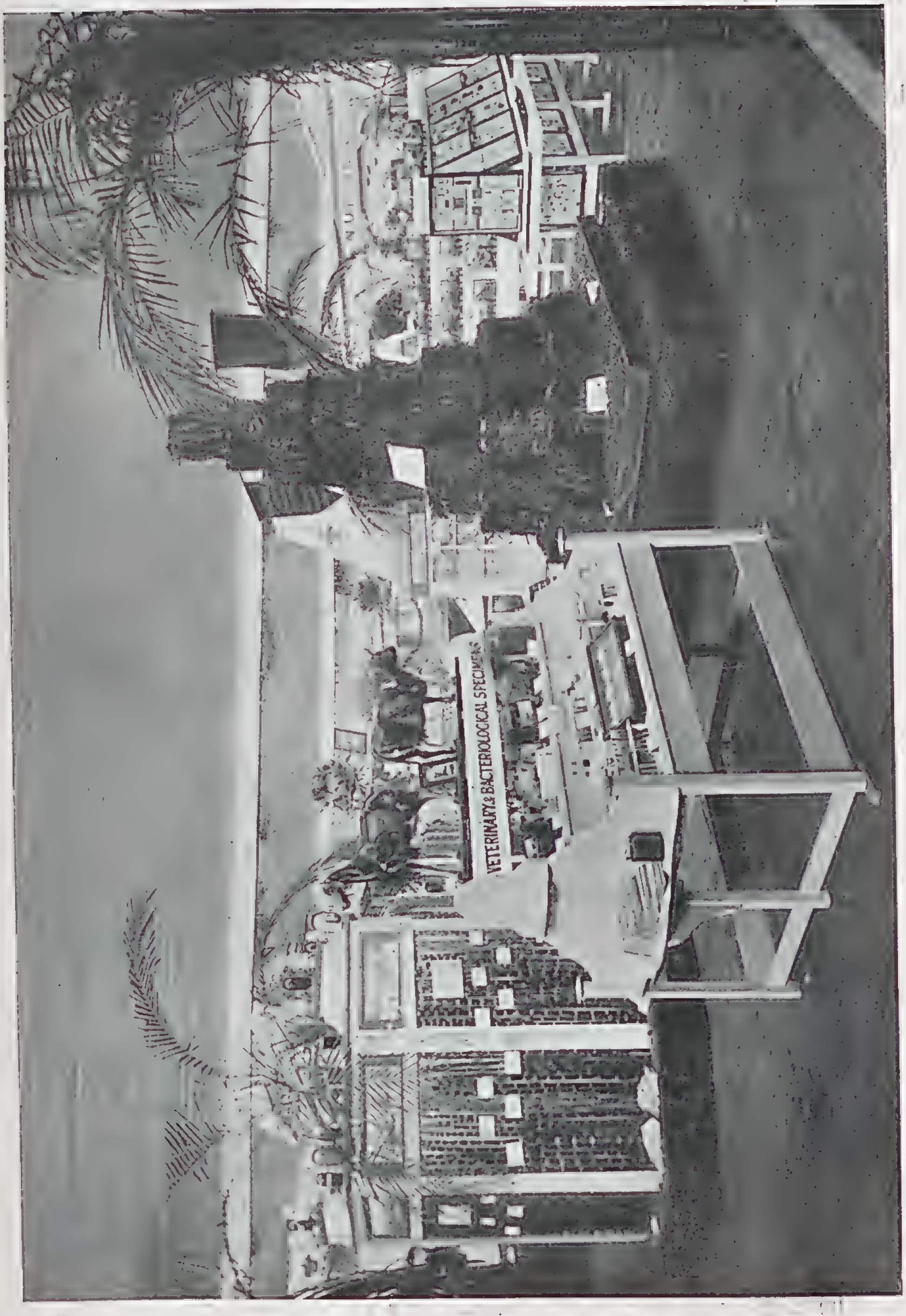


PLATE 30.—MACKAY SUGAR EXPERIMENT STATION, VETERINARY AND BACTERIOLOGICAL, ENSILAGE, AND INSECT LIFE HISTORY EXHIBITS, BRISBANE SHOW, BOWEN PARK, 1912.

green vine in vigorous growth, and the sweet-scented pod as prepared for market. An exhibit of many kinds of spices, such as pepper, cinnamon, nutmeg, turmeric, &c., is also very instructive. Root crops may here be seen which belong to purely tropical countries, such as cassava, bitter and sweet, and many kinds of yams. Other articles of great economic value are here seen in profusion, such as coffee—Liberian, Arabica, Magaropipe, and Robusta—the plants being shown in full growth. Fibres, both in the leaf and extracted, are represented by sisal, Mauritius hemp, Ramie or China grass, and the banana fibre, known commercially as Manila hemp.

Amongst the growing plants are the coca, from which the cocaine of commerce is extracted; the Kola nut, cocoanut, and other palms, the bread fruit, jack fruit, &c.

All the operations needed to produce the finished marketable products from these plants are fully described by the Instructor in Tropical Agriculture, and the manager of the nursery.

DEPARTMENTAL SILOS.

There are shown in the Agricultural Section several kinds of silo, and full instructions as to the method and cost of construction are supplied.

SUGAR TROPHY.

Included in this display is a collection of the most approved varieties of cane grown in the State. Those varieties have been raised at the Sugar Experiment Station, Mackay, and attached to each sort is a label giving a brief description as to the origin and its value to the sugar-grower.

Samples of the various grades of refined sugar—white and brown, syrups, molasses, are also shown, together with their by-products.

CEREAL EXHIBIT.

This trophy is practically a demonstration of scientific investigation in the culture of cereals, embracing as it does the result of experiment work conducted by the department last season at various centres adjacent to the Western and South-western railway lines.

Briefly, the main object of the experiments is to introduce new or improved varieties of wheats; to test the influence of cultivation and the efficacy of an application of artificial manure.

The display is very complete, showing as it does samples of the respective soils in which the wheats were grown. An analysis of those soils, specimens of the crop grown at each centre (straw and grain, with labels attached), showing yield per acre and weight per bushel.

Samples of the wheat, bran, and pollard manufactured from the grain are shown, together with the analysis giving information as to strength of flour, colour, gluten, percentage of bran, pollard, &c. The flour mill used in the making of those determinations is shown at actual work.

CITRUS FRUITS IN COLD STORAGE.

With a view of showing what can be done with our citrus fruits during the glut, and to prove that it is possible to export oranges oversea, the department is preparing an exhibit of this fruit which, by the time it is on show at the Exhibition, will have been over two months in cold stores.

In the early months of this year, when the grapes were most plentiful, the senior inspector carried out an experiment with local grapes, which, after keeping them in cold stores for a week, brought them out with the bloom on, and this with ripe fruit, every berry being sound when the cases were opened up.

DIVISION OF ORNITHOLOGY AND ENTOMOLOGY.

The office of the Government Entomologist and Vegetable Pathologist is responsible for an exhibit of unique interest, which, while it demonstrates the nature and mode of action of typical injurious and beneficial insects, serves also a most useful purpose in illustrating the many facts connected with these on which methods for coping with them are necessarily dependent. These exhibits bring under notice the more important insect enemies of truck (market garden) crops, as well as those of the citrus and pomaceous fruits, whilst, in a more general manner those of our economic plants generally are displayed, the notorious Fruit Fly, Maize Moth, and Cotton Boll Worm receiving the fullest treatment. All the specimens are not only clearly labelled, but, in each case, the habit, life-history, and transformations, and the outward features of the insects, are portrayed. Connected with these exhibits is a most interesting and valuable collection of native insectivorous and fructivorous birds, which is a splendid object lesson to all whose business lies in rural pursuits, and should also serve to instruct the thoughtless young pearifle sportsman as to what birds he should refrain from destroying.

VETERINARY AND BACTERIOLOGICAL SPECIMENS.

Numerous specimens illustrating diseases found in this country are exhibited in this section. Amongst these will be noted *Tubercular Mammitis.* This mammary gland, compared with a normal one in the

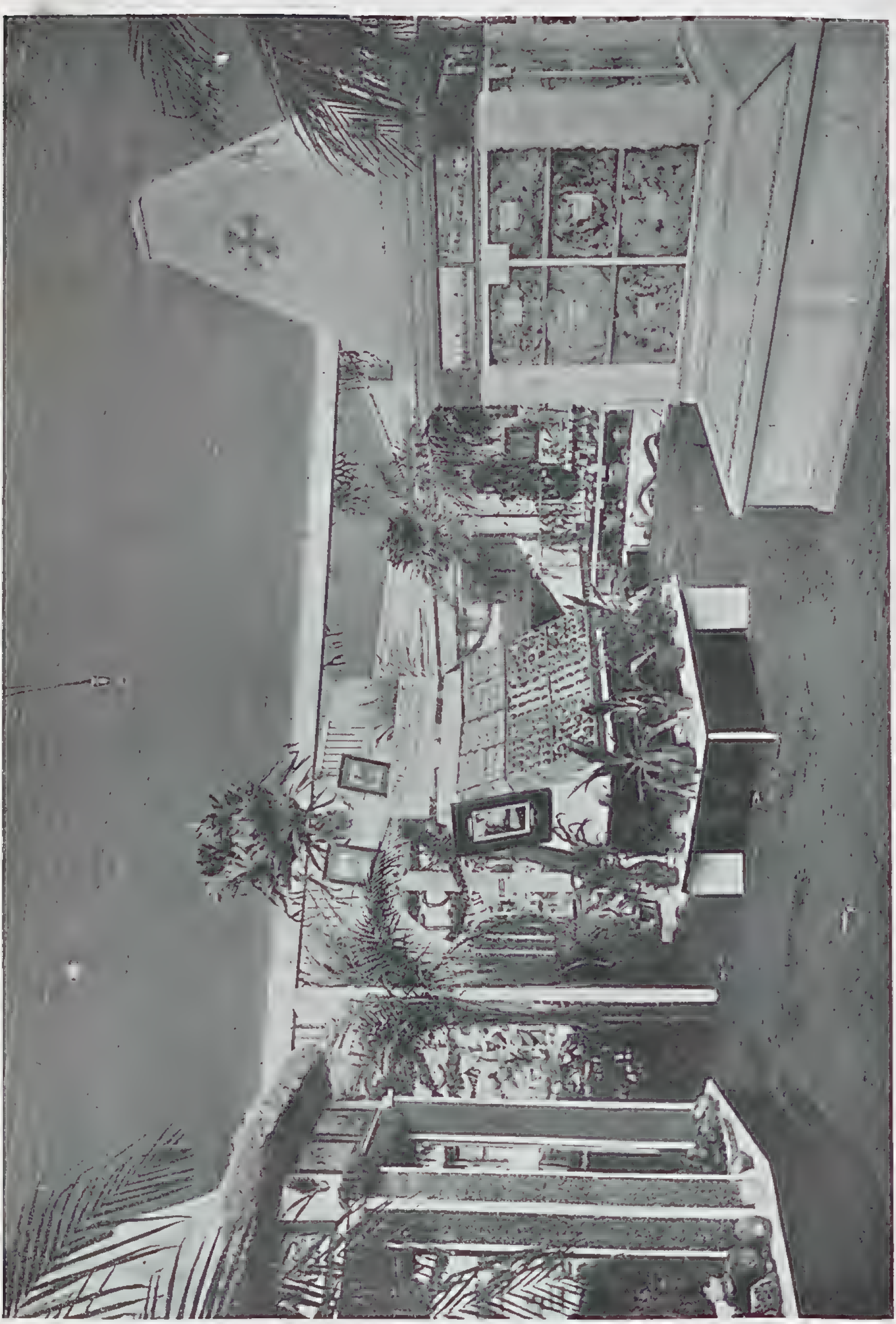


PLATE 31.—COLD STORAGE (CITRUS) FRUITS, AND WOOL AND COTTON EXHIBITS, BRISBANE SHOW, BOWEN PARK, 1912.

adjoining jar, clearly shows the macroscopical appearance. Other organs of the body affected with the same disease will be noted, including a pig's spleen, the heart, tail, and spine of a bullock, &c. Another interesting specimen, illustrating a disease which has been troubling the pig owners in the metropolitan area in the last few months, is one of swine fever. Ulcers will be noticed in the various parts of the specimen, although the disease is not always shown in such a typical manner. Sometimes it is represented by a diphtheric inflammation of the mucous membrane.

Various parasites infesting the alimentary canal of animals are shown, viz., the *amphistoma conicum,* which is commonly found in cattle, although it has not a very deleterious effect unless present in large numbers.

Various *ascarides* from animals are also exhibited. These too are not very prejudicial to health unless present in large numbers. There are also tape-worms from the horse, the pig, and the fowl. These are very troublesome to deal with, as segments are frequently passing from the animals, but unless the head portion is expelled from the body the tape worm continues to grow and worry the animal.

Among the bacteria exhibited will be noticed—

Tubercle Bacilli, both human and bovine, cultivated on Glycerine Agar.

Bacillus Prodigiosus, found to be contaminating bread at a city bakery and rendering the bread a brilliant red colour in the course of forty-eight hours.

Bacillus of Bitter Milk, growing on Agar Agar.

Bacillus Coli Communis, producing gas bubbles in Glucose Agar. This particular sample taken from proposed water supply for butter factory.

Bacillus Subtilis, growing on Agar Agar. This bacillus is commonly found in hay, straw, &c.

Series of Agar Cultures in Petri dishes, showing method employed in isolating and counting bacteria.

Test Tubes containing various media employed in the cultivation of bacteria, viz., Plain Agar, Blood Serum, Gelatine Agar, Egg Media, Plain Beef Broth, and Wort Agar.

Cultures of Lactic Acid Bacteria as prepared by the department and supplied to cheese factories for use as a starter.

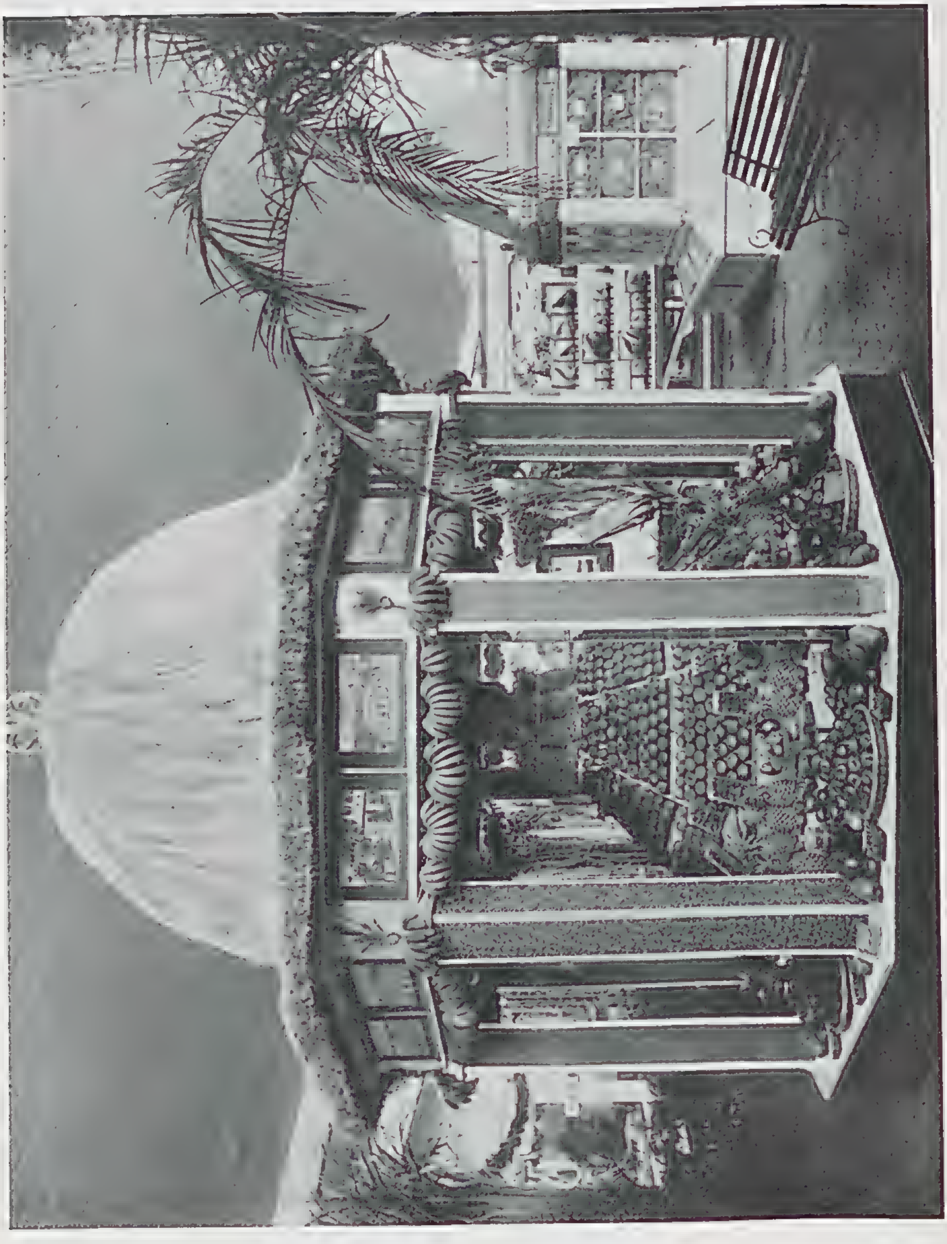


PLATE 32.—FRUITS AND AGRICULTURAL EXHIBIT, BRISBANE SHOW, BOWEN PARK, 1912.

PLATE 33.—INSECTIVOROUS BIRDS (ENTOMOLOGICAL BRANCH) EXHIBIT, BRISBANE SHOW, BOWEN PARK, 1912.

Tropical Industries.

VANILLA AND MANGO TREES.

BY HOWARD NEWPORT, Instructor in Tropical Agriculture.

The mango-tree in North Queensland affords a luscious fruit, a grateful albeit somewhat dense shade; is exceedingly ornamental, especially when the new and young leaves of various shades of bright red are thrown out against the background of the older, dark-green leaves; it is an evergreen, hardy, and fairly quick growing, is easily raised, and very adaptable in the matter of soil and situation. Is it any wonder, then, that it is so popular a tree? Hardly is a farmhouse to be found in the bush without its group of these trees; hardly a country town allotment but can show a mango-tree; many a site of a long-decayed homestead is marked by the double line, circle, or square of mango-trees, and often the only indication of the first clearing made by the original agricultural settler is the clump of mango-trees, which still bear the sweetest fruit. Could a census of imported trees be taken, surely the mango would easily head the list.

The fact that this tree bears a sweet and wholesome fruit no doubt played a large part in its selection in the earlier days. Later the fruit became more common and, on account of its bad carrying qualities and the absence of any wholesale form of factory treatment, never has been a factor of any moment in the financial economy of the farm. Now in a good season the produce of thousands of such trees is just allowed to rot. Nowadays the value of a mango-tree as a fruit-producer is at a discount. But its value as a shade tree and its ornamental appearance still hold good, and in very many instances can an old mango-tree owe its life and continued existence to this fact.

As already stated, hardly a country homestead is to be found without its mango-trees of from five to ten or twenty, and perhaps even thirty, years of age, grown to such a size that where grouped they unduly crowd each other, and where in the garden are often far too near the house for comfort. While their utility has become questionable from every aspect, nevertheless one is often loth to destroy or remove them, for old associations' sake, because of the knowledge that other and new trees take so long to attain an appreciable size, and for various other reasons.

In these days of utilitarianism it is, however, being recognised that those things that can be useful at the same time as being beautiful are more attractive than the merely ornamental.

The suggestion that these trees should be turned to account by the cultivation of vanilla vines on the trunk and over the lower branches is, therefore, being received kindly and "catching on," as the Americans would say, to a surprising extent.

The proximity of such trees to the residence becomes an advantage when the lady and daughter of the house are taking an interest in the cultivation of this pretty as well as valuable orchid creeper. And why should the ladies not do so? It requires little if any more attention than any other orchid,

is every bit as pretty, much more interesting and (not to be despised) offers a source of quite an appreciable amount of pin money, if properly cultivated.

Most old residences have ample harbour for quite an extensive plantation of vanilla, and many have bushhouses whether they have shade-trees (and ideal conditions for vanilla culture unutilised and going to waste) or not. So why not make the bushhouse remunerative and the shade-trees pay their way? Vanilla can readily be made to pay and pay well in tropical Queensland. It takes two to three years to come into bearing, but lasts subsequently for a quarter of century. It requires that its blossom shall be hand pollinated, which is a delicate but quite easy operation quickly and readily done by ladies and children. The fruit or beans must be carefully cured, too, but there is no digging and delving, lifting or sawing, casemaking or carting, that necessitates calling in the services of the strong man, once the vines are under way. In fact, all that is necessary in the way of propagation, cultivation, and preparation can be readily learned from the pamphlets of the Department of Agriculture, which are obtainable free on application. The far more important matter in the production of this costly though popular flavouring bean is suitable conditions for its growth, comprised in climate, siil, and situation.

The vanilla vine is essentially tropical, and is soft-bodied, so it will not stand cold winds or exposure, not to mention frost, but rejoices in humidity. The soil should by preference be fairly rich and certainly well drained. The mould formed by rotted leaves is ideal for it. In situation it must be protected and shaded. Hence its affinity for bushhouses and the trunks and lower limbs of shady trees. When grown on a large scale, scrub is brushed but not felled, and the vanilla planted against the stems of the standing trees, or else special shade-trees are grown for it. This is not always convenient, however, and often quite suitable situations and conditions for its growth are to be found in the convenient mango grove quite near the house.

In reply to a number of queries as to how to prepare these groves for vanilla and how to start the small vanillery, the following suggestions are offered:—That such groves of mango-trees can be satisfactorily utilised for vanilla is shown by the illustration, which is a photo of the smaller vanillery at the Kamerunga State Nursery made from a group of some nine large mango-trees planted about 30 ft. apart. In this case, the trees being fairly wide apart, it was possible to put between them rows of posts and rails for the vanilla vines as well as to have them on the trunks of the mango-trees themselves, and the experiment has proved a great success.

In many cases, however, on selections, &c., cattle and horses have access to the trees, in which case but few lower branches will be found, and often the twigs and leaves have been eaten back to a height of 6 ft or 7 ft. as cleanly as if clipped by shears. When required for vanilla, stock must henceforth be kept away from the immediate vicinity of the trunk at least. So if the mangoes are in the paddock or stable-yard they must be fenced off. Where this has not been the case, more or less low-lying branches will be found which are very convenient for draping the vanilla vines on, and admit of dispensing with the rails or bars. The next most important matter is the regulation of the shade. Vanilla, while it requires shade, also needs air and some sunlight, while many of the old mango-trees have grown so dense that

little or no sunlight ever penetrates the canopy of leaves to the stem. The best way to regulate this is to have some of the middle branches in the centre of the tree cut away from the inside. This creates a gap at the top of the tree through which a certain amount of sunlight can reach the vanilla about mid-day.

It might be thought that this would make the tree unsightly, and spoil its appearance; but this is not so, for if neatly done it cannot be seen from outside. Nor does it materially affect the bearing of a tree. The amount of such centering that must be done depends on the size and density of the mango-tree, and also on the height; but, generally speaking, about one-quarter of the diameter of the whole tree should be thus opened up—that is, a tree 40 ft. across would require about a 10-ft. opening. It will be found that comparatively large limbs can be cut away without making as large an opening in the canopy of foliage as might be expected. Since these limbs are almost vertical, however, great care must be exercised in the cutting out, or accidents will happen. It must also be remembered that wherever such an opening has been made the branches surrounding it will immediately commence to take advantage of it and to fill it in, so that in course of time

PLATE 34.—The small Vanillery at the Kamerunga State Nursery, Cairns, under Mango-trees. Area, about $\frac{1}{10}$th acre, and carrying about forty Vanilla Vines.

it will have to be reopened. Most mango-trees will require this centering, but not necessarily all. Where light is obtained at the trunk and the shade is naturally chequered the thinning-out may be dispensed with. Where the trees are far enough apart the space between them may be utilised in the manner shown in the illustration. This pruning, and of course the fencing, is, however, all that it will be necessary for the ladies to have assistance for.

The vanilla cuttings may then be planted with two or three eyes in a shallow trench only some 2 in. or so deep, and with the greater part of them leaning against and lightly tied to the trunk of the mango-tree in the usual way. When planted, dead leaves, &c., may be raked up around the newly planted cuttings in the form of a mulch. Should the mango-trees have been the haunt of stock, however, it is well to remember not to include in this mulch any animal manure, as the vanilla is better without it.

Where the soil is poor and the drainage indifferent (for mango-trees will often thrive in seemingly poor localities), a circle may be formed by laying stones or small logs around the tree 4 ft. or 5 ft. from the trunk. These need not be large, and if only 6 in. high are ample when filled in with the dead leaves and rakings, to form a sort of raised bed and to rectify both the poverty of the soil and the drainage for the vanilla roots.

At the base of a large mango-tree four vines may be thus planted, and to just an ordinary tree two or three will be sufficient. February or March is about the best time to plant in these parts, when it is usually showery. If dry it may be necessary to water the vines until they shoot. This will not take long, and the fleshy, light-green shoots will soon start their zig-zag climb up the tree. Within a few months, if these are not watched, they will run away up the tree quite out of reach, for the growth is very quick once the plant is established. Where branches of the mango run out more or less parallel with the ground and within easy reach the vines should be trained along them, and later merely draped over them. Where such convenient branches do not exist bars or rails must be supplied. Where the trees are close together a rail may be laid from a convenient fork say 5 ft. or 6 ft. above the ground across to a similar fork in the nearest tree, but where this is not practicable the rails may be allowed to rest on a post of the fence, if near enough, or separate posts must be erected to support one end of them. One rail (failing a convenient branch) is sufficient per vine. These rails need not be more than 4 in. or so in diameter and should not be less than 2 in., but hardwood (whether sawn, split, or with the bark on is immaterial) is preferable to soft wood, as the latter rots and breaks just as the vine becomes a useful size and is beginning to pay best.

The first season after planting is devoted to growth, but in the second season a few flowers will generally be formed. These are more useful in affording material for study and practice in pollination than in their value. By the third year, however. a fair crop may be anticipated, which, starting with perhaps twenty or thirty beans per vine, will rise to 200 or 300, and possibly a good many more. Roughly, it takes from 100 to 150 vanilla beans to make 1 lb., which, if properly cured, sized, and packed, is worth from 12s. for small to 15s. or 16s. for good, and even up to 20s. or more for fine and long per lb. So that a grove of even six or eight mango-trees with three or four vines on each may easily be worth in a few years £15 to £20 per annum.

No weeding, no pruning, and no watering is ordinarily necessary, the work of culture consisting of watching the vines to prevent their growing out of reach, pollinating the flowers in season, and harvesting and curing (drying) the beans as they ripen.

It is by no means intended to suggest that mango-trees are the best on which to grow vanilla, nor is it meant to be implied that other trees will not do for it. Almost any permanent shade-tree can be adapted to the requirements of vanilla, especially the more spreading ones and those in groups. Single trees with their branches high from the ground do not lend themselves so well to utilisation by this means, and generally do not afford sufficient protection to the vanilla.

While many more suitable trees may be found on which to grow vanilla were it desired to undertake its culture in earnest and to any appreciable extent, still by means of the easily arranged adaptation suggested in this paper vanilla will be found the most interesting as well as payable, and therefore about the best, product for the utilisation of existing but otherwise useless or at least unproductive trees, since at a minimum cost and no extension of area it will dovetail in with almost any agricultural industry in the tropical parts of our State, and, with comparatively little extra work, add an appreciable quota to the income of the settler.

THE COIR INDUSTRY.

Now that there appears to be a good prospect of the cocoanut being extensively planted in North Queensland, we wish to point out one of the many valuable products of the cocoanut palm, which should not be neglected. When on a visit to some of the native villages and copra-producing stations in Papua, we saw huge piles of cocoanut husks lying about, and no attempt was made to turn them to profitable account in the shape of cocoanut fibre or coir, for which there is a very large market both here and oversea.

In connection with this subject Mr. M. Saleeby, fibre expert to the Philippine Department of Agriculture, Manila, writes the following interesting article to the "Philippine Agricultural Review" (May, 1912):—

INTRODUCTION.

Coir is the fibre obtained from the pericarp, or husk, of the cocoanut. It is the most important and most valuable, but not the only fibre produced by the cocoanut tree. The other fibres and fibrous materials produced by the tree, such as the leaflets and their ribs, the structural fibre of the leaf-stalks, and the sheaths surrounding the trunk at the bases of the leaves, have all been used since a very remote period for a wide variety of purposes by the natives of all the countries where the tree is grown. The use of coir, however, may not have been as ancient as that of the others, but at a later period it became so general that the value and importance of the fibre were very widely known; and in some countries, such as the Laccadives, we understand the natives used it long ago as a commodity of exchange.

The preparation of coir for local use by the natives has been practised, more or less, in almost every country where cocoanuts are cultivated. Its production and preparation for export purposes, however, is limited to only a few countries, chief among which are the southern half of the Indian Peninsula, especially along the coasts, Ceylon, the Laccadives, and the Malay Peninsula. In the above countries coir is exported either in the raw state, in yarns, or in ropes or some other manufactured form.

Until the year 1851, and for a short period afterwards, the uses made of coir were restricted to the manufacture of coarse ropes and mattings, and, a little later, to the stuffing of cushions and mattresses. Since then the introduction of ingeniously constructed machinery has considerably increased the uses of the fibre by so handling and preparing it as to render it sufficiently fine for the loom and for other weaving and cordage machinery. Thus we now see rugs and mats of different textures and devices, ropes and cables of different sizes and types, brushes, brooms, hammocks, and a variety of other common articles, all of which are made entirely from coir.

PICKING OF THE NUTS.

The stage of ripeness at which the nuts should be picked for separating the coir is a question around which has centred a great deal of discussion. Several tests have been made, which proved that the nuts that are between nine and ten months old, or before they are quite mature, give a finer, whiter, and more elastic fibre than when they are thoroughly ripe. In ripe nuts the husks become brown and hard and the fibre coarse and stiff, necessitating a longer period for retting it in water. As a result of too long retting, the fibre is bound to depreciate both in colour and in strength, thus showing at a glance that the production of the high grades of coir will seriously interfere with the copra crop, which is far more valuable and more important than the former. The thoroughly ripe nuts produce more and a better grade of copra than the less ripe ones. This fact is so well known now that some authorities on the subject have even gone so far as to recommend piling the ripe nuts in heaps on the field or on platforms for a few days or weeks prior to opening them, believing that this will improve the quality of the copra and also increase its oil content. The above fact will help to explain why the progress of the coir industry has not kept pace with that of the copra industry, and it also constitutes one of the chief drawbacks to a more general practice of coir production.

SEPARATION OF THE FIBRE.

Up to a comparatively recent period, the separation of coir from the husks was carried on by retting in water. Several attempts have been recently made to invent machinery to separate the fibre; and while some have been, in a measure, successful, yet most of the fibre is still being separated by the old method. The retting method is used all over the coir-producing countries, the process being practically the same in all of them.

In the British East Indies, including Ceylon and the Laccadives, and in the Malay Peninsula, the husks are removed and piled in holes or pits dug in the sand along the sea beach and kept under the influence of salt water for a period varying from eight to twelve months. During this period the husks are kept from floating away by placing large stones over them. At the end of this period the husks are taken out and beaten with mallets and afterwards spread in the sun to dry. After drying, the fibre can be easily separated from the extraneous matter by rubbing. In localities which are not accessible to a body of salt water the husks are soaked in pits of fresh water, but in this case the water becomes foul, and the fibre is both discoloured and weakened. Fresh-water tanks, from which the water can be changed as often as required

and in which the water can be occasionally heated by steam in order to reduce the period of retting, are the latest and most satisfactory improvements on the native method described above. Steeping in water, in any event, is bound to leave its effects on the fibre by discolouring and weakening it, besides being a long and tedious method that can be practised only in countries where labour is extremely cheap.

In Java coir is produced on a small scale in the central southern district where the fibre is used locally for making brushes, ropes, mats, &c. The method used there is as follows:—The useless surface layer of the husks is scraped off in order to expose the cellular tissue to the disintegrating action of water, after which the husks are soaked thoroughly in water for several days. The husks are then taken out of the water and are beaten with a round wooden mallet while they are wet. This operation of soaking and beating is repeated as often as necessary until the fibre is completely separated from the pulp. Usually four or five repetitions prove sufficient for that purpose.

In the Philippines even less coir is produced than in Java. Its quality is also inferior to that of the latter, and is used only for caulking boats and ships as a substitute for oakum, for which purpose it is highly suitable.

Several machines of different sizes and capacities have recently been invented to separate the coir from the husks. General opinion as to the practicability of using such machines seems to be divided. Some claim that the cost of transporting and dividing the husks, together with the cost of handling them during the several processes through which they must pass from one apparatus into another, entails too much expense. and cite in defence of their arguments the several attempts that have been made and ended in failure. Others seem to believe that the use of machines has in many cases demonstrated their suitability and practicability, and ascribe the failure of the several attempts that have been made to mismanagement from a business point of view.

One of the best coir machines is that built by Messrs. Larmouth and Co., Manchester, England, which the writer witnessed in operation during the Surabaya Fibre Exposition. This consisted of a series of machines run by one power and designed to handle the fibre in its different stages of preparation, from crushing the partially soaked husks to the final processes of weaving coir mattings and making cordage. A brief description of this compound machine will serve to explain the general principle in which all coir machines, more or less, agree. The different parts which compose this machine are—

1. *Crusher*, which takes in one-fourth part of a husk at a time and loosens the fire from the binding cellular tissue.

2. *First scutch wheel*, against which are held, one at a time, the pieces of husk that have passed through the crusher. The two halves of each piece of husk are cleaned separately, each half being fed in two to four times.

3. *Second scutch wheel*, which is provided with finer teeth than the preceding one and through which the pieces of husk that come out of the former should be similarly fed in for further cleaning.

4. *First card*, which is designed to clean and straighten the fibre turned out by the second scutch wheel.

5. After carding, the fibre passes through a *cleaning machine*, consisting of a revolving drum, which shakes off all dust and other impurities.

6. A *second card* is again used, through which the fibre is made finer and becomes ready for its final treatment.

7. *Spinning and weaving and other machinery*, which are used to make from the cleaned fibre the articles it is intended for.

YIELD AND VALUE.

The yield of coir depends upon the variety of nuts produced, the fertility of the soil, and the stage of ripeness at which the nuts are picked. According to Robinson, the proximity of the trees to the sea-coast also affects the yield of coir. These are, in all probability, responsible for the several widely divergent estimates given by several writers. Another cause that may have led to the difference in the estimates of the yield of coir is the method of computing the yield from few nuts and making that the basis upon which to calculate the produce of a certain number of trees or a certain area planted with them, which method has been lately disapproved as being impracticable and often inaccurate.

Basing my figures upon the most conservative estimates, it may be safe to state that every 1,000 nuts will produce on an average 65 kilos of yarn and 10 kilos of brush fibre. At this estimate a hectare of land containing 110 trees and producing an average of 50 nuts a tree per year will produce about 385 kilos of yarn and 55 kilos of brush fibre, valued at approximately 60 pesos, which is practically 20 per cent. of the value of the copra crop produced from the same number of trees.

To give a general idea of the prices paid for coir at the present time, I quote below an extract from the monthly circular of Messrs. Ide and Christie, dated London, 15th February, 1912. The prices are estimated per ton, and are roughly reduced to Philippine currency:—

	Per Ton. Pesos.
COIR YARN.	
Common to good Cochin roping dholls	85-140
Common to good Cochin roping bales	100-150
Common to fair Cochin weaving bales	180-220
Fair to good Cochin weaving bales	230-260
Good to extra Cochin weaving bales	270-320
Common to fair Ceylon dholls and ballots	160-190
Fair to good Ceylon ballots and bales	210-230
Good to extra Ceylon ballots	240-280
COIR FIBRE.	
Cochin, common	90-150
Cochin, fair	170-190
Coochin, good	200-220
Ceylon, short to fair	100-105
Ceylon, clean long	110-140
COIR ROPE.	
4½ to 6 in.	130-180
2½ to 3½ in.	130-200
1½ to 2½ in.	130-200

DESCRIPTION OF THE FIBRE.

Dodge describes the fibre as follows:—Coir fibre appears in the form of large, stiff, and very elastic filaments, each individual of which is round, smooth, and very clean, resembling horsehair. It possesses a remarkable tenacity and curls easily. Its colour is a cinnamon-brown. These filaments are bundles of fibres, which, when treated with the alkaline bath and ground in a mortar, are with difficulty separated by the needles for microscopic examination.

The individual fibres are short and stiff and their walls very thick, notwithstanding which this thickness does not equal the size of the interior canal. The surface does not appear smooth; it is often sinuous and the profile appears dentated. The diameter is not very regular. The points terminate suddenly and are not sharp. The walls appear broken in places, as if they were pierced with fibres, corresponding with the fissures of the sections.

A comparative test of the strength and elasticity of a coir rope as compared with those made from *Hibiscus cannabinus* and *Sansevieria zeylanica* showed, according to Doctor Wright, that the first broke under a strain of 224 lb. (103 kilos), the second under 190 lb. (87.4 kilos), and the third under 316 lb. (145.3 kilos). Other tests made at the office of the Marine Board of Calcutta with most of the cordage fibres of commerce showed that coir ranked No. 12 in strength and No. 1 in elasticity. This latter quality makes coir particularly desirable in all cases where sudden strains are anticipated, such as for moorings for ships during rough weather and other similar objects.

CONCLUSION.

By a careful review of the facts mentioned in this paper and pertaining to the methods of preparing coir and to its uses, value, and yield, it appears plainly that the only hope for establishing the coir industry here in the Philippines lies wholly in the introduction of suitable machinery designed, not only to separate the fibre from the husks, but also to manufacture it into the various articles for which it is used. Even then, it cannot with certainty be stated that satisfactory results will be assured, as such machines require a large outlay of capital and can only be operated profitably in large estates or in localities where the trees are grown in large numbers sufficiently concentrated so as to reduce to a minimum the expense of transporting the immense number of husks. Such localities are further limited when we consider the fact that the production of coir with or without the use of machinery is bound to conflict, to a more or less serious extent, with the copra industry. This may come about in two ways: First, in many instances the husks are badly needed for fuel used in drying the copra in the localities where there is no pronounced dry season; and second, the production of good grades of coir affects the yield and quality of the copra crop, owing to the alleged belief that the stage of ripeness of the nuts for the production of the best coir does not correspond with that at which the production of the best copra is obtained.

The retting and hand methods used in the various countries where coir is produced are so slow, tedious, and inadequate to the requirements of a successful industry, that it is useless to attempt to encourage their practice here. The use of small machines designed only to separate the fibre from

the husk has not, as yet, come into general use, and the results of the various tests have not yet definitely decided their efficiency and practicability.

The discussion of the coir industry given in this paper is not intended to discourage any judicial attempts directed towards establishing the industry here in the Philippines, but rather to point out the principal difficulties that must be considered and overcome before any such attempt can come to any satisfactory realisation. In making such an attempt, or for further information on any phase of the industry, the Bureau of Agriculture will gladly give all the help and advice that lie within its scope of action.

THE PROPAGATION OF THE AVOCADO.

BY P. J. WEBSTER, Horticulturist.

(From the "Philippine Agricultural Review," Vol. IV., No. II., November, 1911.)

The fact that the avocado (*Persea gratissima*) will thrive and fruit in the Philippines is now being established beyond doubt, as trees introduced in 1903 by the Bureau of Agriculture are this year bearing their second crop. A short exposition of the experience gained in the propagation of this fruit by the writer during seven years' study of tropical fruits in south Florida may, therefore, be of timely interest. The method described has been used repeatedly on a large scale by the writer, as well as by others with uniformly good results.

The seed of the avocado is very susceptible to injury from fungi, and loses its viability very rapidly by being exposed to the air, and it should on that account be planted as early as possible after it is taken from the fruit. Where delay is unavoidable, the seeds should be covered by moderately moist soil. Seeds treated in this way can, however, be left for a short time only, as germination in most cases starts very early, much more so than in the seed of the mango.

There are two methods of propagating the young plants; (*a*) To grow and bud the stock in pots or boxes, and (*b*) to plant the seed in the nursery, bud the stock there, and afterwards take up the budded plants, transplant them to boxes or pots, and grow them in a plant-shed until they are large enough to set out in the field. The direct transfer of plants from the nursery to the field has never been done on an extensive scale, as far as the writer is aware. In Florida, where on account of the sandy character of the soil this does not adhere well to the roots, the avocado transplants with more difficulty than citrus trees, but it is quite probable that in loamy and clayey soil, where the plant can be taken up with a ball of earth around the roots, it could be moved without serious trouble.

If the plants are to be grown in pots or boxes the seed should be planted in pots 15 centimetres in diameter, or boxes 12 to 15 centimetres in width and 25 centimetres in depth. The bottom of the pot or box should be covered with broken potsherds, coal ashes, small stones, or gravel, to provide proper drainage, and the seed should be about 15 to 20 millimetres with soil. Sandy loam, rich in humus, is good potting soil. After planting

the seed, the pots should be plunged in a frame in a plant-shed giving about half shade, and should be covered with a thin layer of straw or leaves to prevent evaporation and washing out of the soil by the usually heavy fall rains. The watering required is usually, at this stage, very slight, but the pots should be looked after frequently to see that the soil does not dry out, nor, on the other hand, should the soil be kept wet and soggy by excessive watering. In two or three weeks after planting the first plants begin to appear above ground, and as they reach a height of 15 to 25 centimetres they are shifted to another frame and given more room. Sturdy plants are obtained only by giving them plenty of room, other conditions being favourable. As soon as the plants in pots are about 25 to 30 centimetres high, they are shifted to a larger-sized pot, are 17.5 to 20 centimetres in diameter, and may be budded as soon as they have attained the thickness of a lead pencil. The plants should remain in the boxes until they are planted out. If the plants are grown in pots or boxes, a plant-shed should be constructed so as to give half shade to shelter the plants from wind and sun.

No one who is not well versed in the care of pot-plants should attempt to grow the stock-plants and bud them in pots or boxes, or else the result is sure to be discouraging—if not a complete failure. It takes an experienced man to keep the plants not only in a growing condition but in a condition of perfect health, with the sap flowing freely, and in condition for budding. To do this the plant should receive a certain amount of water from day to day, and this only a trained man can rightly gauge. If over-watered the soil sours, the roots decay, and the growth of the plant is suspended; if too little water is given, even for one day, the cambium layer dries up and bark sticks to the wood as if it is glued; in either case budding is impossible. Also, the plants should be examined every three weeks, if not oftener, and all roots that have started to grow through the drainage vent cut off. If this is not attended to, the greater part of the root system of the plant will soon have formed outside of the pot. The avocado is a voracious feeder and soon exhausts the available food supply in the pot, and the fertility of the soil must be renewed by artificial means. Where cow manure is available, this may be mixed with water, strained through a sieve or a coarse cloth into a barrel and diluted until it assumes the colour of weak coffee, the plants should then be watered with this mixture once in two or three weeks according to their condition. Frequently manure is not readily obtainable, however, and resort must be had to artificial fertilisers. Only the most soluble chemicals should then be used—those that furnish a plant food immediately available. The writer has for several years used the following formula for many kinds of tropical plants (including the avocado, mango, anonaceous plants, guavas, &c., and different species of palms), applied at intervals as directed for the manure water with highly satisfactory results:—

Nitrate of soda	275 grammes
Sulphate of potash, 49 per cent. ...	125 grammes
Acid phosphate, 16 per cent.	350 grammes
Water	100 litres

Care should be taken to see that all the constitutents are well dissolved. The acid phosphate has a tendency to settle at the bottom, and the solution should, therefore, be stirred up now and then.

If the plants are to be budded in the nursery the seed should be planted about 20 centimetres apart and covered with 15 to 25 millimetres of soil in rows laid off 1 metre or more apart to suit the convenience of the propagator. If the soil is dry, the land should be well irrigated after the planting of the seed, and the rows where the seed is planted covered with a mulch of straw, leaves, or seaweed. In order to induce the plants to develop a better lateral root system the rows should be gone over when the plants are about 15 centimetres high, and a sharp-edged spade thrust diagonally into the ground under each plant, cutting off the taproot about 10 to 12 centimetres below the surface of the ground. The weeds should be kept down by frequent shallow cultivation. Deep cultivation should be avoided.

For propagating work in the nursery, the simplicity of the method, the rapidity with which the work may be performed, coupled with great economy of material—a valuable feature where this is scarce—renders the method of shield-budding preferable to all other methods of propagation. The avocado, fortunately, responds well to this method.

Much has been said about the difficulty of budding the avocado, particularly in regard to the failure of the buds to start, though *if proper conditions are observed* it is only slightly more difficult to bud than the orange or the peach. The principal difficulty according to the writer's observations has been mainly with the operator, who has lacked the manual skill necessary for success and the good judgment necessary for the selection of buds; not infrequently it has been due to a poor budding knife. Budding and grafting of a plant are analogous to a surgical operation on a human being, but the man who would be horrified to see a surgeon pull out of his pocket a rusty and dull jack-knife to perform an operation will frequently go and bud avocados or other plants with just such a knife, and then wonder why so many buds failed to grow. The wonder is that any could grow at all. Not only should a budding knife made expressly for the purpose be used for this work, but it should be absolutely clean from all impurities and have an edge keen as a razor. A small whetstone and leather strop should be included in the working toolkit, so that the knife can be sharpened as needed. The writer, in his budding work, frequently tests the keenness of the blade on his forearm; if too dull to smoothly shave the hair the knife is ground and honed before another bud is cut.

Budding should never be attempted unless there is a good flow of sap, so that the bark separates readily from the wood. Old hard budwood should not be used, for, unlike the citrus, anonaceous fruit and several other plants, the buds of which are sunk into the bark tissue, and from which new buds issue if a sprouting bud is broken off, the buds of the avocado are mostly raised above the bark; consequently if a bud fails to sprout, it frequently falls off even before the leaf itself has dropped, thus leaving a blind bud incapable of producing any growth whatever. Because of this feature of the avocado and the tendency of the old buds to drop, the use of old budwood will always be accompanied by a certain percentage of loss from buds going "blind" even after a perfect union between stock and scion has become established. Another reason for the failure to get the buds to sprout, complained of by some propagators, is that the buds are cut too small, and that the leaf buds proper are small and poorly developed and unable to start before the rapidly growing callus around the bud smothers it. The importance of

the selection of budwood from the current year's growth—sufficiently mature so that it does not snap on bending, carrying vigorous and well-developed buds that are not crowded on the budstick, thus allowing the cutting of large buds—cannot be too strongly emphasised. Suitable budwood may be "made to order" by manuring the trees heavily with nitrogenous fertilisers and irrigating them a few months before the budwood is wanted.

After the wood has matured as indicated, there need be no fear that it is too tender. In fact, the tenderest full-grown buds may be used with success in the hands of a skilled budder. The writer has frequently used the tip of a budstick, inserting it as a "spring bud" with good success. The bud should be inserted as near the ground as possible, for this will save much time later, otherwise consumed in rubbing off adventitious buds, and the buds also have a tendency to start easier when inserted near the ground than when placed higher up on the stock. In countries where light frosts may be expected during the winter, it gives better opportunity to protect the bud by banking the tree with soil than if the bud is inserted far above the ground.

In making the opening in the stock to receive the bud, make a vertical incision about 35 to 40 millimetres long, at the lower end of which make a horizontal incision as shown in Plate 1 (*c*).* Then lift the bark by passing the point of the blade under the bark upward from the horizontal incision making a wound suggesting an inverted T. The T bud may also be used, and the bud is then pushed downwards, but the inverted T bud has been found to be the more advantageous and expeditious method. The bark should be lifted sufficiently so that none but the gentlest pressure is needed to insert the bud in position. Now cut a bud of the size shown on the accompanying plate,* by passing the knife diagonally under the bud, taking care not to cut the bud too thin, and that no tear or break is made in the tissue; place the bud in position and tie firmly—but not tight enough to strangle—with grafting tape; begin at the horizontal cut and cover the entire bud to prevent its drying out and to prevent access of water. In the light of the experiments conducted by the writer the avocado may be budded at all seasons of the year; however, in large practice it is best not to bud at the approach of the dormant period, for the reason that the buds then sprout with more difficulty than at other seasons, in the meantime being in danger of becoming callused over.

For tying material, raffia, soft cotton, string, or grafting-tape is used. The writer has found grafting-tape preferable, as it prevents the drying up of the bud before circulation has been established between scion and stock, and excludes all extraneous moisture, which, when other tying material is used, frequently enters the bud and destroys it.*

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* A wax preferred by the writer in grafting or for making wax cloth is made of equal weights of beeswax and rosin. Other recipes are: Rosin, 3 kilogrammes; beeswax, 1 kilogramme; linseed oil, 0·5 litre. Or: Rosin, 2 kilogrammes; beeswax, 1 kilogramme; tallow, 0·5 kilogramme.

The wax is prepared by placing the ingredients in a suitable iron pot and melting them over a slow fire. Liquid wax may be made by melting 1 kilogramme of wax made according to the last recipe mentioned, and adding 0·75 litre of alcohol; mix thoroughly and keep in a tightly corked bottle.

The best material for grafting-tape is cheap cotton cloth that tears easily. Tear up the cloth into strips 15 to 20 centimetres wide; wind the strip of cloth on stout iron wire until the roll is not more than 4 centimetres in diameter; if thicker the wax will penetrate with difficulty to the centre. To prevent the cloth from being undone tie a string around each end of the roll. The weight of the wire causes the rolls to sink in the mixture while the cloth absorbs the wax; if sticks of wood are used on which to wind the cloth the rolls should be weighted down. Place the rolls in the melted wax which will saturate the cloth in about 15 minutes. Do not place the rolls of cloth in the mixture in a *boiling* state, or the cloth may be burned. When ready to use unroll the cloth and tear it into strips about 20 millimetres wide.

If the weather is warm and the stock is in growing condition, the union will take place in two weeks, sometimes even in a shorter period, and the buds are then unwrapped to below the leaf bud, and the top of the stock lopped about 7 to 10 centimetres above the bud. If, on examination, it is found that the union has not yet been formed, replace the wrapping for another week. It is important that, in a vigorous and rapidly growing species like the avocado, the unwrapping and lopping be attended to as soon as there is a good union, as otherwise the callus soon grows over the bud and smothers it before sprouting—one of the difficulties experienced by amateur operators. In order to force the bud to start, it is no less essential that all adventitious sprouts be rubbed off as soon as they make their appearance.

After the bud has made a growth of 15 to 20 centimetres and ripened by its wood the stock should be trimmed off by a sharp knife immediately above the bud. The cut should be covered with grafting wax or paint to prevent the entrance of fungi which, if this is not attended to, frequently enter the wound and destroy the bud. The fungi not frequently enter the stock through the wound that is made at the point of lopping the stock, working downward until they destroy the bud; they are recognised by the brownish appearance of the bark and wood. The only means by which a budded plant attacked in this way may be saved is by trimming off the stock to the bud and covering the cut with grafting-wax, linseed, or paint.

After being trimmed the plant is left in the pot until the wound is healed, when it is ready for planting in the field. If the pot-grown plants have been given good attention, and budded at the proper time, the majority should be ready for the field a year from planting the seed—the more precocious even earlier. In a well-conducted nursery all stocks should be budded before they are six months old.

Where the plants are transferred to boxes before planting out this should be done after the wound is fairly well healed up. Before taking them out of the ground prune off about one-third of the foliage. Great care should be exercised to prevent the roots from drying out or from being bruised. In "boxing" the plants, carefully work the soil in among the roots and allow them to remain in as natural a position as possible. Water the plants thoroughly and keep them well shaded for a few days. When they have thoroughly established themselves they are ready for transplanting to the field.

RAMIE.

[CONTINUED FROM AUGUST ISSUE.]

CULTIVATION.

For the cultivation of Ramie fibre suitable for textile purposes only one special method should be followed which causes Ramie, especially the *Boehmeria nivea*, to grow in a new and more perfect condition.

Under ordinary circumstances it takes about two years before the plant possesses the particular kind of fibre which is easy to obtain and to work. Under very favourable conditions and with the application of sufficient quan-

tities of manure, as suggested by the example of Mr. P. Faure, Limoges, good crops may be obtained much earlier.

This considerable long period has often been the cause of bad results in both cultivation and treatment, for if the young Ramie plants are not given sufficient time to fully develop they are not fit to stand the many changes of weather and soil conditions, and would under no circumstances yield a good and regular crop. In such case the leaves are too close together, which causes the fibre to become irregular in strength and shape. This means a great inconvenience that can sometimes not be overcome for a speedy and regular degumming process and for the spinning.

Even at the present time, when Ramie has found its way into many industries, many spinners are of opinion that Ramie is only obtainable in very irregular fibres.

As has been previously stated, Ramie will not stand excessive heat or cold, drought or humidity, heavy wind or strong light. Although there is no possibility of the plant dying under such conditions, Ramie will then branch out very quickly and the fibre will quickly get woody. The plant remains small, and is of no value for the mechanical production of fibre.

According to Mr. Forbes Watson the stalks are composed of—

	Per Cent.
Carbon	47.28.
Hydrogen	6.26.
Nitrogen	.09.
Oxygen	42.23.
Ashes	4.14.

whilst the analysis of Ramie ashes yields—

Alkalies:

	Per Cent.
Potash	32.37.
Soda	16.39.
Lime	8.40.
Magnesia	5.39.
Silicium acid	6.60
Phosphoric acid	9.16.
Sulphuric acid	3.11.
Carbonic acid	8.90.
Silicium acid	6.60.

I have mentioned before, under the heading of "Botany," that Ramie grows nearly everywhere, and I will add that, for the actual cultivation, the best obtainable soil is hardly good enough. The quick growth of the plant, of course, takes a lot out of the soil, and it is obvious that only under the best conditions of soil and weather the stalks may be expected to be ripe in two months. It is only under such conditions that five crops per annum may be expected in tropical countries. The previous failures may partly be put on this account; for, when previous calculations of the crop were made, the weight of the green stalk, say 100 grammes, was multiplied by the average amount of stalks per plant, say 10, and the amount arrived at was again multiplied by the average number of plants per hectare, say 15,000. Thus the following calculation was made:—

$100 \times 10 \times 15{,}000 = 15{,}000{,}000$ grammes or 15,000 kilogrammes.

Taking these figures as a basis, and calculating four crops per annum, a weight of 60,000 kilogrammes (135,000 lb.) green stalks per hectare soil would be arrived at. It stands to reason that such expectations resulted in a disappointment, for in these estimates nothing was put down for manuring, and no allowance was made for the feeding substance which was continually extracted from the soil, seeing that the roots remained in the soil and were expected to produce fresh stalks. I am so much better in the position to judge these mistakes as I have personally had ample occasion to witness same.

If, therefore, we repeat that the cultivation of Ramie does not by any means require any complicated conditions, we will point out that for the obtaining of a marketable fibre, suitable for a subsequent treatment by machinery, the following things are required, viz. :—

1. A suitable healthy species of Ramie.
2. A good, porous kind of soil.
3. Much rain and humidity.
4. Much manuring.
5. Ample time.

A porous soil of humus or the ash of volcanoes are two kinds of soil which may be found in Java and Sumatra, and will give good and certain results.

Anybody who will go in for Ramie will do best to start with it on a small scale to ensure a good stock of plants; for these cannot easily, if at all, be purchased. This has always been a point of much deception. It has been overlooked that Ramie may alter its qualities through many influences. It may form bast, or lose its good qualities and, under such conditions, its suitability for propagation.

For the propagation by means of seed, seed-beds are usually laid out. The seed may also be sown on the plain ground of the field, as has often been suggested by various quarters. Nursing-beds may also be laid out from cuttings taken from the woody parts of the stalks, which plants, if sufficiently developed, are put in the fields, allotting them sufficient space, whilst cuttings taken from the roots may be put directly in the field.

The space between the plants should amount to 2 ft. 3 4 ft.; but it is appears that the thicker the plants are planted the better they grow, which is probably the result of the fact that the plants are better protected against wind, warmth, and too much light.

Ramie must at least be planted so thick that the weed is exterminated, and one need not be afraid of injuring the Ramie roots. The soil is simply ploughed over. This is absolutely necessary to keep the soil porous.

For planting, neither the dry nor the rainy period of the year should be chosen. Especially a period of severe droughts should be avoided for planting, as the stalks would otherwise get too woody in a very short time. With regard to the manuring, the kind of soil has first to be considered. Generally speaking, liquid manure seems to be the best. Ramie is ready to be cut when the back of the stalk near the root loses its fresh green colour. Shortly before that time the fibre is strongest and best suitable for subsequent treatment.

TREATMENT.

The main reason of the fact that Ramie has not yet taken the importance of jute and hemp is to be looked for in the fact that the latter article cannot be treated in a similarly simple drying process.

The Ramie fibre must always be separated from the stalks by hand. It is attached to the stalks by means of a special kind of plant-gum, which chemists call vasculose, cutose, or pectose. The composition of this plant-gum is such that the separation of these fibres can only be effected with a lot of inconvenience and very incompletely. Always parts of the gum, which gradually get firm, remain attached to the epidermis, and cause considerable trouble when the bleaching, dyeing, and spinning process is applied, as well as an irregular thread.

According to the use of the fibres, the following division may be made for the treatment:—

A.—THE RAW FIBRE.

From this raw fibre, cordage, cables, and fishnets are made. It is also used in the boot industry, for making paper, &c., and instead of flax.

B.—THE TREATED FIBRE.

The treated fibre is used in the textile industry.

All good waste of both treatments has nearly as much value as the fibre itself, which is used in the spinning-mill, as it is composed of pure cellulose, which the paper and powder manufacturers are always prepared to buy in any quantity.

In an untreated state, only the following main types are in use up to the present time, viz.: —

1. Rhea emanating from British India.
2. China Grass emanating from China.
3. Ramie emanating from Sumatra.

The treatments of these different kinds are the following, viz.:—

I. RHEA.—In a dry state the stalks are split with an ordinary knife. The wooden parts are extracted, dried, packed in bales, and exported. The drying process has to be very carefully effected, as fibres which are not completely dry ferment very quickly, and are therefore unsuitable for further treatment. Through not exercising sufficient care in this respect, great quantities are sometimes lost for treatment. The market value of this dried Rhea fibre amounts to about 12s. c.i.f. Liverpool.

This method of treating Ramie is, however, not remunerative for planters as the market value of the fibre thus obtained is very low.

For years Rhea has met with a ready sale to the Ramie factories, which found that the outturn of China Grass emanating from China was too expensive. They had their own machinery to remove the gum of the plant and the epidermis by the most suitable means. This method offers no great difficulties if certain chemicals are applied, especially caustic soda.

II. CHINA GRASS.—The treatment applied in China, and principally in the provinces of Hupeh, Kiangsi, Hunan, and Szechuan, is effected as follows, viz.:—The stalks growing from the root-stock are cut when ripening, and are carefully protected against drying by softening them for some time in water, after which the epidermis can be removed by means of a blunt knife.

The fibre bundles thus obtained are subsequently dried in the sun for six hours. The fibre, to which the greater quantity of gum is still adhering, is subsequently treated with lime water, caustic potash, and rice straw. The gum is removed, and the fibre is afterwards bleached. Most of the product which is brought on the market as China Grass is still rough—*i.e.*, not degummed. In that state the product, according to quality and length of the fibre, has a market value of from £26 to £40 per ton c.i.f. Liverpool.

All manufacturers who used to work Ramie fibre have up to the present time been in the habit of buying this China Grass. It stands to reason that the manufacturers would be glad to become independent of the Chinese market, seeing that they could only obtain the small quantity of fibre which China did not require for own consumption by paying a price that was dictated to them.

III. RAMEH.—For centuries a method of treatment is followed in Sumatra which, it is true, is generally but little known, but by which a product is obtained which is also suitable for European use. The Ramie stalks, immediately after having been cut, are carefully dried in the sun. Only a few days later the stalks are broken through, by which process the fleshy part and the bark drop off the fibre like dust. Subsequently the bark appears showing a fine yellow colour. They are considerably softer than the fibre of China Grass.

The value of this fibre is higher than that of China Grass, and amounts to £40 to £50 per ton.

It is well known that for a long time many have endeavoured to effect the above described manual treatment by machinery. A look into the literature on Ramie—or, better, the patent statutes of the different countries—shows how many hundred builders of machinery have taken out patents. Each patentee, of course, claims that his particular machine were sure to give the required result, and that by applying his treatment so much water, straw, as well as electricity and even ice, were required.

The question which the different inventors have tried to solve, and the aims which they had in view, have not always been clear to me, although I have for weeks been digging up the patent statutes of the various countries, and made a special study of the results obtained. And *there is no machine yet where the green stalks can be thrown in at one side and suitable fibre of Rhea or China Grass be taken out at the other.*

The spinners follow their particular method of spinning, and prefer to apply the method which answers their own particular purposes best, and for which their machinery is specially adapted.

No good results are likely to be obtained with the Rhea type, if the market price does not amount to more than £12 per ton. Nor is it worth the trouble to invent a suitable machine for this treatment; and the main thing is thus to be able to supply a better and more remunerative product.

Seeing that the planters are glad to take ready cash for their product, and only proceed to mechanical treatment if they themselves are satisfied that the method adopted is likely to lead to good results, I should recommend to those who intend to take up the treatment of the raw product, not to always use the Rhea and China Grass types, but to take up the simple treatment of the variety of Rameh growing in Sumatra. Various sorts of

machinery facilitate the treatment, and one is sure of a sale. Planters, however, who are prepared to take up the treatment of fibre for textile purposes will have to face greater expenses, as they will have to get a complete plant for the removal of the gum to be able to deliver a product that can be used direct by the spinners.

This product should be called "Filasse ready for spinning but uncombed." The market value of this product does not depend on the cost price charged by the spinners, but on the world market. It would amount to about £80 per ton in Europe.

As I have mentioned before, the value of Ramie fibre lies, in the first instance, in its good natural qualities—as strength, subtlety, shine—and in its silvery colour. It is, therefore, essential that it do not lose these excellent qualities when the treatment is applied.

In a country like Java, where there are no patent statutes, it is, of course, not easily possible to apply a number of new methods likely to admit of benefiting from previous experience, but it is obvious that better results are obtained if Ramie is treated immediately after it is cut. This treatment is preferable to a treatment a few months later. There is also a sufficient number of methods for a suitable removal of the gummy parts.

However, he who is looking for a machine capable of converting by inexpensive and remunerative means Ramie stalks into China Grass cannot yet be accommodated.

COMMERCE.

It may be taken as a fact that Ramie fibre, notwithstanding its actual state—provided it has not undergone any interfering changes—will find a good sale, as the manufacturers in Europe have long overcome the various difficulties in the way of treatment, and are always able to appreciate the excellent qualities of Ramie fibre. Another very important item is to obtain sufficiently large quantities of the raw material and for the planters to supply a product in such a state that anybody can use it.

As long as there is no possibility of bringing the raw Ramie fibre (*i.e.*, the fibre to which the gum is still adhering) as a standard type on the market, so that it will pay, so long is it absolutely useless to think—as is a frequent belief—that there is only one way of cultivating, treating, and using Ramie, for numerous treatments are required for as many purposes.

The calculation of the cost of cultivation being too extensive, it is not possible to put down a calculation showing the chances of success; for the raw fibre, as it is negotiated on the London market—for the Scottish boot factories—requires a plant for treatment totally different from that applied to fibres for Enschede and Liverpool, &c.

NOTES ON COFFEA ROBUSTA.

A correspondent of the "Revue Agricole," the organ of the Chamber of Agriculture of New Caledonia, writes as follows on the *Coffea robusta*:—

The ravages of *Hemileia* in our plantations of *Coffea Arabica*, and particularly in the case of the Leroy coffee-trees, have compelled us to face their replacement by the Robusta variety, which exhibits a remarkable resistance

to the disease. The Chamber of Agriculture has just received 300 kilos of Robusta seed, and supplies it to colonists at 4 francs per kilo at Noumea; and if sent by parcel post an additional 1 franc 10 cents per package is charged.

The advantages of *Coffea robusta*, according to an exhaustive study of it by M. Kramer, Director of Agriculture at Buitenzorg (Java), which has already appeared in the "Revue Agricole," are the following:—

Precocity.—In Java the Robusta yields a first crop at two years of age. In the third year the yield is 500 grammes ($15\frac{3}{4}$ oz.) per plant, and from the fifth year onwards over 1 kilo ($2\frac{1}{5}$ lb.) per tree.

Harvest.—This continues in Java throughout the year, as the berries do not all ripen at the same time, but during consecutive months; and this is an advantage, as it permits of a more economical utilisation of the permanent labour force, and does away with casual labour at picking time, which labour is difficult to obtain and very burdensome.

Yield.—Six kilos (about 13 lb.) of cherry Robusta yield 1 kilo ($2\frac{1}{5}$ lb.) of beans, a greater yield than that of *Coffea Arabica.*

Value.—We have frequently published in the "Revue Agricole" figures which show that at Havre, the *Coffea robusta* sells at about the same price as our Caledonian coffee (present current price, 2 francs 50 cents to 2 francs 80 cents per kilo (2s. 1d. to 2s. 8d. per lb.), equal to about £118 per ton.

Resistance to Hemeleia.—It has been asserted that *Coffea robusta* has shown spots of hemeleia. This is certainly not impossible. In Java this variety is not absolutely immune, but it resists the disease; the leaves do not fall off, and the tree continues to flourish and fruit.

Cultivation.—The Robusta must be planted under shade, and at a further distance apart than the Arabica. In Java the trees are planted 3m. x 3m., quincunx, or about 10 ft. apart each way. When the plant has attained its fourth or fifth year, the shade may be removed. The trees are topped at about 6 ft.

Special Precautions.—A good plan is to treat the nursery plants with preparations of sulphate of copper or flowers of sulphur.

A NEW COCOANUT PEST.

Too much care cannot be exercised in the introduction of plants from foreign countries to safeguard Queensland planters from loss due to the importation of some new disease or some insect pest. The Department of Agriculture in this State is quite alive to the danger, and we only draw attention to the additional pest of the cocoanut in view of the fact that, in the northern parts of the State, both cocoanut and rubber plantations are beginning to be established.

The particular pest mentioned appears to be restricted to certain areas in the Philippine Islands, and we may state that the Department of Agriculture in the Federated Malay States has considered it advisable to prohibit the importation of palms, &c., from the Philippines.

NOTE.—In Queensland the yield of *Coffea Arabica* cherry is about 50 per cent. parchment, and about 90 bushels of parchment make 1 ton of clean coffee.—Ed. "Q.A.J."

A description of the pest was published in the "Philippine Agricultural Review" for March, 1912, and reads as follows:—

A parasite of the cocoanut palm, which may prove to be the most serious pest of this crop in the Philippine Islands, was discovered in May, 1911. This insect is related to the White Fly of the citrus orchards of Florida, and this fact alone is sufficient to cause the cocoanut planters considerable anxiety. For the present, however, it appears that this insect, which may be termed the Cocoanut White Fly, is confined to a district in Negros Oriental, extending from the barrio of Tabon on the north and the barrio of Zamora on the south, a range of some 35 kilometres in length. Most of the cocoanut groves in this area, which extends from the sea-coast back to a range of hills to the west, are infested with the parasite.

The first specimens were collected on the hacienda of Mr. Henry Gardner, in the vicinity of Guijulgant. It appears that this is the first occurrence of any insect of this genus in the Philippine Islands; and, furthermore, the species itself is new to science. It has been described by Mr. Quainstance, of the Bureau of Entomology, United States Department of Agriculture, D.C., as *Aleyrodicus destructo*. A similar species (*A. cocois*, Westw.) occurs in the West Indies, and has caused immense damage there to the cocoanut groves, some districts having even been abandoned largely on account of its attacks.

Like all of the so-called "White Flies" (which are, of course, not flies) and the related "scales," the individuals are very small and not readily noticeable except when present in large colonies. The general colour of the older individuals is white or grayish; at first the larvae are nearly naked and of a pale brownish shade, but when about half-grown they develop a fringe of white waxy material around the edge of the body. This waxy substance, as the insect grows, gradually covers the entire body with a mass of cottony, thread-like appendages and waxy flakes.

The minute eggs are laid on the under surface of the leaflets—usually on the young leaves of the palm. Thus far it appears the insect is attacking by preference only the young palms—that is, those under six or eight years of age; but unless checked it will probably soon spread to all the palms in the vicinity.

Soon after the eggs are hatched the young insect begins walking about on the underside of the leaf in the endeavour to find a suitable position for its attack. Satisfying itself as to location, it inserts its beak through the epidermis of the leaf and begins to suck the sap from the soft inside tissue; after becoming thus attached, the young insect seldom moves, unless disturbed, until it attains its full size. Shortly before emerging as a winged insect it stops feeding, but remains attached to the leaf. Though comparatively weak fliers, the danger of their passing through the air from one tree to another is greatly increased by the action of winds, since when the insect may only wish to fly from one leaf to another, it may be accidentally borne by the wind to a considerable distance.

Some of the colonies contain scarcely more than a dozen individuals, while others contain many thousands, and form an irregular white area over the underside of the leaf. This feature of their colour is exceedingly valuable to the cocoanut planter, since it allows him to readily determine the presence of a colony in his grove.

Although a hymenopterous insect, evidently a parasite of this cocoanut pest, was observed in the act of laying eggs in or upon the immature White

Flies, it is not likely that any natural parasites will be of much avail in checking the spread of this pest. Therefore the cocoanut planters in the infested district should immediately go through their groves, cutting off and burning all attacked leaves, or portion thereof; and, by the same token, it would be well for all cocoanut planters to carefully look over their young groves, and if any white insects are discovered they should report the fact at once to the Director of Agriculture, and should remove and burn all traces of the parasite. In certain cases it might be advisable to treat the pest with kerosene emulsion, or some similar spray, but unless the grower has had experience with such remedies the use thereof would probably be in vain, if not actually injurious to the tree itself. Fumigation could be recommended only for extreme cases, and then only for young trees.

If this pest is taken in hand immediately, there is very little chance of its spreading to other districts of the Philippines; and it is earnestly hoped that cocoanut planters throughout the Visayas and Tabayas will make a strenuous effort to prevent the spread of this pest, which, although apparently new to these Islands, may within a few years become an exceedingly important factor in the cocoanut industry of the Far East.

NEGLECTED INDUSTRIES.

LIQUORICE.

We have had some inquiry lately as to the cultivation of the liquorice plant. Botanically, this is known as *Glycyrrhiza glabra.* It is a native of the south of Europe, Syria, Persia, and China. It is cultivated largely in Spain, whence the names of its products, "Spanish juice" and "Spanish liquorice." It forms an important crop in some parts of England—notably in Surrey and Yorkshire.

It is a perennial herbaceous plant, having very much the appearance of a vetch. It attains a height of 2 ft. to 3 ft., and bears pale-lilac flowers, producing a peach-shaped fruit containing seeds like a minute vetch. The plant is grown for its long, cylindrical tap-roots, about the thickness of a finger, which strike to a great depth in the soil, sometimes attaining a length of 5 ft. or 6 ft. The roots are brown outside and yellow within, are flexible, tough, and succulent, abounding in a mucilaginous, sweet juice, slightly bitter, which is readily soluble in water. The odour of the root is rather sickly, and like the taste of the beetroot—earthy.

CULTIVATION.

The nature of the root indicates that it requires as deep a soil as that for lucerne, and unless the soil is naturally deep, or made so by subsoiling, and enriched by manure if not naturally in good heart, the plants will, in dry weather, become diseased or weakened and preyed upon by insects, being particularly liable to the attacks of the insect known as Red Spider.

Planting is done in the spring, with cuttings 6 in. long from the small horizontal roots of established plants. The cuttings are placed 18 in. apart, in rows not less than 3 ft. apart, so as to admit of working the soil between the plants. Frequent cultivation to loosen the soil round them is regarded as of great importance. The cuttings must be entirely covered with soil, and

in the first year a light crop—such as onions, lettuce, &c.—may be grown between the rows. As in the case of other root crops, the ground must be kept clear of weeds. As winter approaches, the stems will become yellow and wither, when they may be removed, and the ground should then be hoed and dressed. If young plants are required for a new plantation, they can be procured at this time by forking up the spreading roots near the surface and preserving them in sand for spring planting. These will keep if stored in a cool, dry place. If it is desired to send them to any distance by sea or overland, the more matured roots, packed in sand, will keep for three or four months.

In three years, the main roots will be mature and fit for use, and in the following winter they are dug up. A trench is opened close to the first row as deep as the roots go. The latter are then turned out with a spade, clean to the bottom, and the work is thus carried on from trench to trench. It is important to clear the ground of all the roots—small, as well as larger—as any left in the ground will grow again on return of warm weather, and interfere with whatever crop follows.

The marketable portions are trimmed of all side roots, washed, dried, and tied up in bundles. If kept for any length of time, they should be covered with sand until wanted for use. If kept warm, and allowed to become damp, they are apt to get mouldy.

To raise plants from seed, a properly enriched and pulverised spot of ground should be chosen, and the seed sown thinly in shallow drills early in spring. In rich soil, and under favourable conditions, the growing plants will be strong enough for removal after one year's growth; but a second year's growth in the nursery rows will afford better root cuttings.

MANUFACTURE.

Liquorice is one of those products which require no appliances, except of such simple character as are within reach of the smallest cultivator. It comes to market in various forms, viz.:— (1) The raw product, being the roots simply dried, and tied in bundles. (2) "Spanish Juice," in short, thick rolls, 5 in. to 6 in. long and 1 in. thick, which are wrapped in bay leaves, and in the form of an extract run into boxes of about 2 cwt. each, which is the purest form. (3) Pipe liquorice, which, theoretically at least, is a more refined description, in long, thin pieces, of the shape and about the size of the stem of an ordinary clay pipe. (4) In the form of lozenges. (5) As liquorice powder, which is made by drying and pulverising the root. This has a very pleasant, sweet flavour, and, as it is soluble in water, it is much sold in the streets of French cities as a drink under the name of "Coco."

For making extract, the roots are first thoroughly cleaned, and, after being half-dried by exposure to the air, are sliced up into small pieces and boiled in water until the latter is thoroughly saturated with the sweet, mucilaginous juice. If boiled too long, the sweetness is impaired. This decoction is allowed to rest in order to permit the dregs to subside; and the clear liquor, after straining, is evaporated until it reaches the proper consistence. The resulting extract is then run into boxes or made into rolls and dried in the air, and, while yet sticky, are wrapped in bay leaves.

Refined liquorice is made by simply redissolving the impure extract, straining out any foreign matter, and again evaporating.

One of the most important uses to which the extract of liquorice is put is in the brewing of porter, and it is extensively used for this purpose in breweries. It is also used as an adulterant of tobacco and opium, and is itself largely adulterated. When absolutely pure, liquorice is entirely soluble in water, but in all its forms adulterants are added, such as gelatin, glue, wheat, rice, barley and potato flour, chalk, starch, and cane sugar, and often traces of copper are found in it. "Spanish liquorice," says Accum, "is frequently nothing else than a mixture of the worst kind of gum-arabic imported for such inferior use as that of assisting in the manufacture of shoe-blacking, and it is made up into rolls which are packed and so closely alike in appearance to the true liquorice that it is difficult to detect the fraud." Genuine Spanish liquorice, such as may be seen in quantities in chemists' shops in Brisbane, should be perfectly black, brittle when cold, and break with a smooth, glassy fracture; it should not become sensibly sticky or damp when exposed in a dry place, and it should be entirely soluble in water without leaving any residue.

Some of the adulterants of liquorice powder are:—Wheat flour, woody fibre, turmeric, maize, potato and sago flour, arrowroot, cane sugar, and chalk. It is not generally known that in North Queensland and in Papua there is a wild liquorice plant—*Abrus precatorius*—which bears pretty, bright scarlet seeds, with a jet-black spot at one end. The product of the root of this plant is known as Indian liquorice.

The price for dried roots in European markets is from 4½d. to 5d. per lb.

TIMES OF SUNRISE AND SUNSET AT BRISBANE—1912.

Date.	September.		October.		November.		December.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·3	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·1	5·34	5·28	5·47	4·58	6·6	4·46	6·29
3	6·0	5·35	5·27	5·48	4·57	6·7	4·46	6·30
4	5·59	5·35	5·26	5·48	4·56	6·8	4·46	6·30
5	5·58	5·36	5·25	5·49	4·55	6·9	4·46	6·31
6	5·57	5·36	5·23	5·50	4·55	6·9	4·47	6·32
7	5·56	5·36	5·22	5·50	4·54	6·10	4·47	6·32
8	5·55	5·37	5·21	5·51	4·54	6·10	4·47	6·33
9	5·54	5·37	5·20	5·51	4·53	6·11	4·47	6·34
10	5·53	5·38	5·19	5·52	4·53	6·11	4·47	6·35
11	5·51	5·38	5·18	5·52	4·52	6·12	4·47	6·35
12	5·50	5·39	5·17	5·53	4·51	6·12	4·48	6·36
13	5·49	5·39	5·16	5·54	4·51	6·13	4·48	6·36
14	5·48	5·40	5·15	5·54	4·50	6·14	4·49	6·37
15	5·47	5·40	5·14	5·55	4·50	6·15	4·49	6·37
16	5·46	5·41	5·13	5·55	4·50	6·16	4·50	6·38
17	5·45	5·41	5·12	5·56	4·49	6·17	4·50	6·39
18	5·44	5·41	5·10	5·56	4·49	6·17	4·50	6·39
19	5·42	5·42	5·9	5·57	4·49	6·18	4·50	6·40
20	5·41	5·42	5·8	5·58	4·48	6·19	4·51	6·41
21	5·40	5·43	5·7	5·58	4·48	6·20	4·51	6·41
22	5·39	5·44	5·6	5·59	4·47	6·21	4·52	6·42
23	5·38	5·44	5·6	6·0	4·47	6·22	4·52	6·42
24	5·37	5·44	5·5	6·0	4·47	6·22	4·53	6·43
25	5·36	5·44	5·4	6·1	4·47	6·23	4·53	6·43
26	5·35	5·44	5·3	6·1	4·47	6·24	4·54	6·44
27	5·33	5·45	5·2	6·2	4·46	6·25	4·54	6·44
28	5·32	5·45	5·2	6·2	4·46	6·26	4·55	6·44
29	5·31	5·46	5·1	6·3	4·46	6·26	4·55	6·45
30	5·30	5·47	5·0	6·3	4·46	6·27	4·56	6·45
31	...	...	5·0	6·4	...	...	4·57	6·45

PHASES OF THE MOON.

			H. M.
4 Sept.	☽	Last Quarter	11 23 p.m.
11 ,,	●	New Moon	1 48 ,,
18 ,,	☾	First Quarter	5 55 ,,
26 ,,	○	Full Moon	9 34 ,,
4 Oct.	☽	Last Quarter	6 48 a.m.
10 ,,	●	New Moon	11 41 p.m.
18 ,,	☾	First Quarter	12 6 ,,
26 ,,	○	Full Moon	12 30 ,,
2 Nov.	☽	Last Quarter	1 37 p.m.
9 ,,	●	New Moon	12 5 ,,
17 ,,	☾	First Quarter	8 43 a.m.
25 ,,	○	Full Moon	2 12 ,,
1 Dec.	☽	Last Quarter	5 p.m.
9 ,,	●	New Moon	3 7 a.m.
17 ,,	☾	First Quarter	6 6 ,,
24 ,,	○	Full Moon	2 30 p.m.
13 ,,	☽	Last Quarter	6 12 a.m.

Animal Pathology.

THE CATTLE TICK—A REMEDY.

By G. W UNRO HULL, Eumundi, Queensland.

Realising that throughout all creation Nature provides a balance, and recognising the absolute necessity for such balance, I have always been looking for some natural restraint that could be applied to the cattle tick, and I have tried many simple remedies without success, except in one case, where I found that if cattle were dosed regularly with sulphur in small quantities they carried very few ticks—probably only the fittest, but in this case even the survival of the fittest meant far too many, although these sulphured cattle never became sufficiently infested to show any signs of distress, nor did they lose condition.

But in this sulphurless region this means absolutely no relief to big mobs, where it would be impossible to dose, and I gave up the idea as being of value only to the man with a house cow, and formed the opinion that the only remedy lay in finding a destructive organism that could be introduced into the system of the beast, which, while harmless so far as the beast was concerned, would be fatal to the tick.

Taking on the management of a dairy farm on the Queensland North Coast Railway, in one of the worst tick districts in the State, gave me an opportunity of further investigation, and some two years ago I was fortunate enough to get a clue. I followed it up, and was delighted to find that it led to the locating of the very thing I had fancied must exist somewhere in Nature's general plan. Choosing a particularly "ticky" beast, I vaccinated her with this particular organism, and anxiously watched for the result.

The cow was in full milk at the time, and I expected some reaction, and possibly a loss in milk. In this I was disappointed; there was no reaction, and instead of a loss of milk, there was a decided increase in flow, and as weeks drew on into months, and this cow, instead of being "sprayed" every three or four weeks with the others, remained free from tick, I reckoned the charm had worked; and, taking lymph from the tiny vesicles that she had developed (which appeared periodically on the escutcheon and dew-lap only); I vaccinated a number of other cattle—milkers and yearlings. In every case the result was satisfactory, and while the untreated stock showed the ravages of tick on their necks and flanks, the treated stock grew sleek and clean-coated, and although many of them have not been sprayed or dipped for the past eighteen months they show no signs of tick. With such a result I felt justified in drawing the attention of the State authorities to my fortunate discovery, and the Stock Department have decided to enter upon a series of exhaustive tests next spring in order to prove absolutely or to disprove the efficacy of this tick-destroying microbe.

As a further proof (in my own mind) of its efficacy I can safely say that any ticks that adhere to these vaccinated stock have a very short life indeed.

It is only natural that in a mob of ordinary cattle (tick infested) there will be millions of ticks born every few days, and these minute ticks crawl on to the vaccinated stock just as readily as they do on to the others, and here comes what I consider the strongest evidence in my discovery's favour. Careful observation of a vaccinated beast will show the escutcheon and dew-lap and face to be covered with thousands of newly hatched young ticks, no bigger than grains of salt; all firmly fixed into the hide. If carefully watched, these ticks will in a couple of days be found to be merely dry scales, which fall off, leaving no trace of their existence, while those that have fixed upon an untreated beast will be found to be thriving, and at the same time setting up the irritation that is serious enough to induce poverty and misery to the unfortunate animal, and, if allowed to mature, the beast will present the appearance of being covered with peas, with rough, untidy coat, which is a pitiful contrast to the clean, shiny coat of her vaccinated companion. It sometimes happens that a full-grown tick will adhere to one of these treated cattle, and the result is the same.

These odd ticks, if placed in a box and watched, will slowly shrivel up, and in from two to three days will be dead. It may be as well to mention that an ordinary half-matured tick will live in a box for months!

In some cases I found a well-developed tick on a vaccinated beast, and in some cases these ticks laid a number of eggs before dying, but so far none of these eggs have hatched, although a control tick the same size laid eggs which duly hatched.

It may be said that the older tick takes longer to kill, although the disease destroys its unlaid eggs.

If this be the case, so much the better. It is better to kill the new tick before it grows big enough to become a drain upon its host, and so far as my actual experiments have gone, they have proved that on the ten cows treated it is absolutely impossible for cattle ticks to live more than a couple of days, and in no case have I known a tick to develop on any of these specially treated animals.

What would be the effect upon the tick pest generally if every beast, say, in a zone of 20 miles wide were vaccinated with this organism?

Not being able to mature they would naturally rapidly die out, and if unvaccinated stock were excluded from this area the tick would be an impossibility. Then extend the zones until ultimately the pest was driven into a condition no worse than that of the March fly—*i.e.*, only a nominal worry.

And while I think of it, this organism may be as deadly to the same March fly. Why not? For the benefit of those of a scientific turn of mind I might say that this organism confines its attention to the lymphatics, and is thus taken into the system of the minute tick, probably before it even gets a taste of the actual blood of the beast attacked. The affection may thus be termed a skin affection only, and as the vesicles formed are small, and only noticeable on close observation, there is no pitting or injury to the hide.

It is somewhat peculiar that these vesicles should be only apparent on the escutcheon and dew-lap—the two favourite habitats of the tick itself.

As a further test I have frequently turned a vaccinated beast out into the open country for a couple of months at a time, but the result has always been the same—*i.e.*, she remained perfectly clean—while the wandering stock with her were literally covered, and in some instances had died from tick worry (poverty) even with abundance of fresh grass.

Whether these vaccinated stock throw immune stock or not I cannot say for certain, although in two cases I have immune calves from vaccinated cattle. One vaccinated cow, her daughter, and grand-daughter are all clean, but that is not enough to prove this point; it needs time.

Statistics.

COMMONWEALTH METEOROLOGY.

RAINFALL OF QUEENSLAND.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1911.						1912.						
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.
North.													
Ayr	...	...	...	...	...	...	...	...	3·53	1·16	1·01	6·70	...
Bowen	Nil	0·15	Nil	1·5	0·19	1·32	1·56	3·15	1 86	0·59	1·76	3·78	...
Cairns	1·48	0·27	0·6	0·88	1·95	0·90	4·81	16·68	5·95	4·71	5·97	8·00	...
Geraldton (Innisfail) ...	6·20	0·79	0·30	0·73	1·61	0·75	5·50	18·24	6·01	56·14	41·84	15·25	...
Gindie State Farm ...	Nil	0·49	...	0·81	...	3.50	0·68	2·59	1·88	0·63	...	9·94	3·45
Herberton	0·49	0·5	Nil	0·9	0·62	5·36	5·29	2·82	1·47	1·40	2·20	2·36	...
Hughenden	0·2	Nil	Nil	Nil	1·37	0·69	5·78	1·84	3·52	Nil.	0·74	6·64	...
Kamerunga State Nurs.	...	...	...	...	...	...	...	...	...	*	...	...	...
Mackay	0·43	0·18	0·3	0·93	0·17	0·41	2·08	8·04	·93	3·56	3·42	5·51	...
Mossman	1·28	0·39	0·09	0·55	0·86	3 31	6·06	18·32	17·60	6·40	2·78	8·88	1·33
Rockhampton	0·24	1·17	Nil	0·40	0·6	0·81	2·50	3·24	·14	0·01	1·98	8·38	...
Townsville	Nil	Nil	Nil	0·39	0·31	2·84	1·64	7·57	6·35	4·51	0·63	4·49	...
South.													
Brisbane	1·70	2·22	0·84	4·95	0·84	1·94	1·85	2·13	1·03	0·72	0·20	7·22	...
Bundaberg	0·37	1·15	Nil	2·36	1·30	2·98	3·96	2·47	...	Nil.	1·33	10·23	1·76
Bungeworgorai (Roma State Farm)	...	...	...	...	...	...	0·73	...	2·19	N 1.	...	7·06	...
Crohamhurst	3·58	2·62	0·51	6·27	1·74	3·02	5·62	8·72	13·73	1·77	1·39	9·99	1·67
Dalby	0·68	0·43	0·42	3·45	1·99	1·55	1·76	2·58	·53	Nil.	Nil	4·76	...
Esk	...	1·51	2·04	4·17	0·47	0 44	1·38	8·26	·22	0·36	0·11	7·43	...
Gatton Agric. College	0·72	0 90	0·96	3 77	0·49	1·90	3·56	3·31	7·86	1·35	...	6·63	1·84
Glass Mountains ...	2·79	3·15	0·60	4·58	1·76	1·44	3·37	6·99	13·15	0·31	0·98	7·85	1·86
Gympie	0·97	0·48	0·26	2·42	0·50	2·10	2·92	4·47	·15	0·37	0·52	2·63	...
Ipswich	0·59	1·12	0·34	4·71	0·25	...	1·87	3·00	·41	0·30	Nil	3·93	...
Maryborough	0 62	1·47	0·9	2·81	0·90	4·98	2·39	3·93	·11	0·32	1·09	9·12	...
Roma	0·67	1·55	0·87	1·9	1·55	1·19	0·74	0 76	·85	0·03	Nil	7·96	...
Tewantin	2·53	1·07	0·4	7·48	1·14	2·13	5·60	4·25	·85	0·80	8·46	8·72	...
Toowoomba	...	...	...	...	...	...	...	...	·52	0·66	0·16	6 75	...
Warren State Farm ...	0·6	1·01	...	0·64	...	...	0 82	1·75	2·04	0·22	1·28	9 51	3·35
Warwick	1·20	1·50	0·80	1·78	2·26	0·70	1·57	· 5	·56	0·02	0·9	5·69	...
Warwick, Hermitage State Farm ...	...	...	...	0·60	...	...	...	...	...	...	...	...	...
Westbrook State Farm	...	...	...	...	...	...	...	...	...	Nil	...	...	...
Woodford	...	...	...	...	...	...	...	...	...	...	...	9·7	...
Yandina	2·43	Nil	0·30	2·90	1·36	1·87	5·95	4·84	·95	0·88	1·39	7·42	...

NOTE.—The rainfall data in this table are compiled from telegraphic reports, and must be considered as approximate only. * No Report.

GEORGE G. BOND,
Divisional Officer.

General Notes.

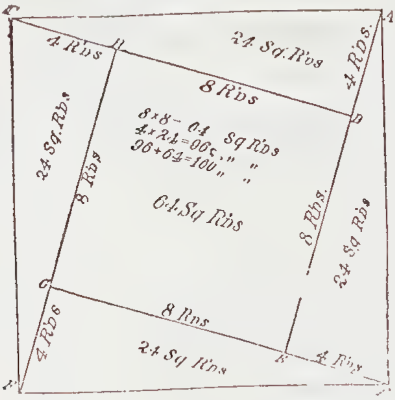
HORSE AND BARBED WIRE.

Unlike the placid cow, when a horse becomes entangled in a broken wire fence, he plunges violently, pulling backwards, with the result that the leg becomes often severely lacerated, and these wounds are frequently most serious and difficult to heal. "Live Stock Journal," on this subject, says:—

"When a horse gets his foot over a wire, instead of trying to avoid injury to the leg, the animal will struggle violently. Wire cuts in front of the hock joint are often very serious, the wound usually extending through the tendons and into the joint. In treating a wire cut, the wound should be kept absolutely clean and exposed to the air and sunshine. When the wound starts to heal, it should not be irritated by washing the raw surface or by removing scabs which have formed. Liquid disinfectants are best applied by allowing the fluid to be poured on to the raw surface, not by rubbing the wound with cotton saturated with the disinfectant. Follow this disinfection by covering the wound with some good healing powder that is both astringent and disinfectant. Should the wound heal too fast, use some form of caustic to remove the excessive granulation tissue."

HOW TO LAY OFF A SQUARE ACRE.

The following advice for laying off a square acre recently appeared in the "Scientific American":—First, a square 8 rods on a side is laid off. Then from each corner one side is extended 4 rods more. These last ends are now connected, and an absolutely square acre is the result. From the



drawing this is evident; for the inside square contains 64 square rods and each triangle contains 24 square rods (base times one-half the altitude or 12 x 4/2), so 4 times 24 is 96; this added to 64 gives the requisite 160. It will be readily seen that the placing of the pegs outlining this square acre is an easy matter, for they each come at the end of a certain rod on the chain.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR AUGUST, 1912.

Article.		AUGUST. Prices.
Bacon, Pineapple	lb.	$6\frac{1}{2}$d. to 8d.
Bran	ton	£7 5s.
Butter	lb.	1s. to 1s. 1d.
Chaff, Mixed	ton	£3 to £5
Chaff, Oaten (Victorian)	„	£7 10s.
Chaff, Lucerne	„	£4 to £6 10s.
Chaff, Wheaten	„	...
Cheese	lb.	6d. to 9d.
Flour	ton	£10
Hay, Oaten (Victorian)	„	£8 5s.
Hay, Lucerne	„	£1 to £6 10s.
Honey	lb.	2d. to $2\frac{1}{2}$d.
Maize	bush.	3s. 9d. to 4s. 6d.
Oats	„	4s. 2d. to 4s. 6d.
Pollard	ton	£8
Potatoes	„	£9 to £11 10s.
Potatoes, Sweet	cwt.	4s. to 5s. 3d.
Pumpkins	ton	£2 to £2 10s.
Wheat, Milling	bush.	5s. to 5s. 2d.
Onions	ton	£15
Hams	lb.	1s. 1d.
Eggs	doz.	1s. 1d. to 1s. 3d.
Fowls	pair	4s. to 5s. 3d.
Geese	„	6s. to 7s.
Ducks, English	„	4s. to 4s. 5d.
Ducks, Muscovy	„	5s. to 5s. 9d.
Turkeys (Hens)	„	9s. to 9s. 6d.
Turkeys (Gobblers)	„	10s. to 20s.

SOUTHERN FRUIT MARKETS.

Apples (Choice), per case	5s. to 10s.
Apples (Cooking), per case	5s. to 8s.
Bananas (Fiji), G.M., per bunch	2s. 6d. to 10s.
Bananas (Fiji), G.M., per case	5s. to 17s. 6d.
Bananas (Queensland), per bunch	1s. 6d. to 6s. 6d.
Bananas (Queensland) per case	9s. to 14s.
Custard Apples, per quarter-case	5s. to 6s. 6d.
Lemons (local), per gin case	4s. to 7s.
Oranges (local), per gin case	3s. 6d. to 7s.
Oranges (Washington Navels), per gin case	7s. to 15s.
Mandarins (Emperors), per gin case	4s. to 7s.
Mandarins (Thorney), per half-case	2s. to 3s. 6d.
Papaw Apples, per half-case	2s. to 3s. 6d.
Passion Fruit (local), per half-case	2s. 6d. to 5s. 6d.
Peanuts, per lb.	$5\frac{1}{2}$d.
Pineapples (Queensland), common, per case	6s. to 7s.
Pineapples (Queensland), Ripley's, per case	6s. to 7s.
Pineapples (Queensland), Queen's, per case	6s. to 7s.
Quinces, per gin case	3s. 6d. to 5s.
Tomatoes, per half-case	3s. to 4s.
Cucumbers, per bushel case	4s. to 5s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Article.	AUGUST. Prices.
Apples (Eating), per case	9s. to 11s.
Apples (Cooking), per case	8s. to 9s.
Apricots, per case	...
Bananas (Cavendish), per dozen	3d. to 3¼d.
Bananas (Sugar), per dozen	3d. to 3½d.
Cape Gooseberries, per case	6s. to 8s.
Cherries, per quarter-case	...
Citrons, per cwt.	12s.
Custard Apples, per quarter-case	4s. to 4s. 6d.
Grapes, per lb.	...
Lemons (Italian), per case	...
Lemons, per case	4s. 6d. to 5s.
Mandarins, per case	5s. to 8s.
Mangoes, per case	...
Nectarines, per quarter-case	...
Oranges (Navel), per case	5s. to 7s.
Oranges (Other), per case	4s. to 6s.
Papaw Apples, per quarter-case	1s. 3d. to 1s. 9d.
Passion Fruit, per quarter-case	4s. to 5s.
Peaches, per quarter-case	...
Peanuts, per lb.	3d. to 4d.
Pears, per case	...
Persimmons, per half-case	...
Plums, per quarter-case	...
Pineapples (Ripley), per dozen	1s. 6d. to 2s. 6d.
Pineapples (Rough), per dozen	9d. to 1s. 6d.
Pineapples (Smooth), per dozen	2s. 6d. to 4s.
Rockmelons, per dozen	...
Rosellas, per quarter-case	...
Strawberries, per tray	1s. to 3s.
Strawberries, per dozen pint boxes	6s. to 10s.
Tomatoes, per quarter-case	1s. to 1s. 9d.
Watermelons, per dozen	...

TOP PRICES, ENOGGERA YARDS, JUNE, 1912.

Animal.	JUNE. Prices.
Bullocks	£7 17s. 6d. to £8 7s. 6d.
Cows	£5 7s. 6d. to £6 10s.
Merino Wethers	19s. 9d.
Crossbred Wethers	23s. 9d.
Merino Ewes	15s. 6d.
Crossbred Ewes	19s.
Lincoln Ewes	20s. 9d.
Lambs	16s. 3d.
Pigs (Baconers)	...
Pigs (Porkers)	...

Farm and Garden Notes for October.

FIELD.—Under ordinarily favourable conditions, harvesting the wheat and barley crops may now begin. Those who have oats for hay should cut it when the grain has formed, but before it is ripe, for then the plant is in its most nourishing condition. Destroy caterpillars on tobacco plants, and top the latter so as to throw all the strength into the leaves. Keep down the weeds, which will now try to make headway; earth up any growing crops requiring the operation; sow maize, imphee, setaria, kafir corn, teosinte, sorghum, &c. Plant sweet potatoes, sisal hemp, yams, peanuts, and ginger.

KITCHEN GARDEN.—Why do so few gardeners and farmers grow their own vegetables? This is a question frequently asked by visitors to the farming districts. The reason probably is, that vegetables require a good deal of care and attention, which means also a good deal of time taken from the ordinary farm work. In many cases it pays the farmer better to buy many kinds of vegetables than to grow them himself. The only vegetables grown so many fine farms are cabbages and pumpkins, not to class potatoes under the head. Many people have an idea that European vegetables cannot be grown during the hot summer months, but this is a great fallacy; the Chinese gardeners supply the towns with all kinds of vegetables, except, perhaps, cauliflowers, during the whole of the summer. It is, therefore, clear that, by constant work, plenty of manure, water, and some shade for seedlings, most vegetables can be produced during the hot months from November to March. If your ground has been trenched or deeply dug and well worked, the advantages will be seen during the coming months. It does not pay to work shallow-dug ground. When sowing and planting during this month, give plenty of room between the rows and the plants; otherwise they will be drawn up and worthless, and keep the ground open by constant forking and hoeing. Thin out melon and cucumber plants. It is a good plan to peg down the vines; they will then not be blown about by the wind; they will take root at intervals, and thus help the main stalk. Give plenty of water to tomatoes planted out last month. They should also be mulched. Sow cabbage, French beans, melons, lettuce, radishes, pumpkins, cucumbers, marrows, rosellas, &c.; and transplant for succession in calm cloudy weather.

FLOWER GARDEN.—Stake any dahlias which may be now above ground, and plant out the bulbs which were stored in a moist place. If the weaker bulbs are reserved, they will come in for autumn planting. Take up all bulbs which have done flowering, and store them in a dry place. Winter-flowering plants will have gone off almost; still, the garden should be in bloom, and will well repay the trouble bestowed on it, and a little fertiliser given as a top-dressing will assist the plants to bloom and look well for a longer time than if they were neglected. Give weak liquid manure to chrysanthemums, and allow no suckers to grow till the plants have done flowering. Take up narcissi. Do not store them, but plant them at once in new situations. Sow antirrhinum, balsam, zinnia, summer chrysanthemum, calliopsis, and nemophila.

Orchard Notes for October.

THE SOUTHERN COAST DISTRICTS.

November is somewhat of an off month for fruit, as the crop of strawberries is about over; pineapples, with the exception of a few off-season fruit, are not ready for marketing; and citrus fruits of all sorts, with the exception of those grown in the latest districts, are now over. Bananas should, however, be improving, particularly if the season is favourable.

The most important work of the month is the cultivation of the orchard, as, in order to retain moisture in the soil, it is essential that the soil be kept in a fine state of tilth. Where land is liable to wash, breaks should be left between the fine-worked land, or, even better, a good break of cowpea or other leguminous crop, valuable for producing nitrogen and humus, should be grown. All fruit pests should be attended to; cyaniding can be carried out where necessary, and is especially useful now in the case of the Red, Purple, Mussel, Circular Black, and Glover Scales. Fruit-fly should be systematically fought; all infested plums, peaches, guavas, or other fruits should be gathered and destroyed, so as to prevent the spread of the pest. Sucking bugs of all sorts should be gathered and destroyed, the egg-clusters, as well as the immature and mature insects, being destroyed. Hand-gathering is as good a plan as any. Fig beetles should be destroyed by spraying with Kedzie's mixture; and the egg-clusters should be destroyed whenever found.

Bananas and pineapples can be planted during the month, taking care, in the case of the pineapples, not to set out suckers that will immediately throw out a fruit, but those that will become firmly established before they fruit. Examine the vineyard carefully, and keep it well worked. Look out for Oïdium and Black Spot, and treat for same as recommended in the Orchard Notes of the two previous months.

Early ripening grapes will be reaching maturity towards the end of the month; but few, if any, will be ripe. In any case do not market too immature fruit; rather wait a few days longer, till it is fit to eat.

THE TROPICAL COAST DISTRICTS.

The main crop of pineapples will ripen during the month; and if gathered at the right time—viz., when fully developed, but not turned colour—they will carry all right South, if carefully handled and well packed. Papaws and granadillas are still in season, and will meet with a good Southern demand; they must be packed in cases containing only a single layer of fruit, and should be sent in the cool chamber. I am certain that a good market can be got for these fruits in both Melbourne and Sydney, particularly at this time of year, when their winter fruits are off and their summer fruits are not yet on.

Watch bananas carefully for fly. Keep the orchards well cultivated.

Only ship good mangoes South; far too much rubbish is sent to Brisbane. Good mangoes will pay to pack properly, but the common sorts, which predominate to an enormous extent, will barely pay freight, if there is a good crop. The canning of good types of fibreless mangoes of good flavour is well worth taking up commercially in the North, as a ready sale for the canned fruits can be obtained.

As in the Southern Coast districts, all fruit pests should be systematically fought, and the orchard should be kept in a good state of tilth, as, once the wet season starts, there is little chance of cleaning up weeds and rubbish of all kinds, or of cultivating and sweetening soil.

THE SOUTHERN AND CENTRAL TABLELANDS.

The earlier kinds of summer fruits, such as cherries, will ripen during the month. See that, if the fruit-fly makes its appearance, it is systematically fought.

Look out for Codling Moth, and continue the sprayings with Kedzie's mixture.

Look out carefully for any San José Scale that may have escaped the winter spraying, as, if the trees are sprayed whilst the young are hatching out, the bulk of the insects are killed and little damage is done either to the tree or fruit.

The sulphide of soda spray is one of the best to use now. Keep Woolly Aphis in check, should it make its appearance, using the resin washes; or, if it and San José Scale are both present, use the sulphide of soda spray.

Watch the vineyards carefully for Black Spot and Oïdium. Keep the orchard and vineyard well cultivated, so as to retain all the moisture in the soil required for the growth of the tree and development of the fruit. In the warmer parts, irrigate when necessary, following the irrigation by deep and systematic cultivation.

See that grape vines have plenty of foliage to protect the ripening fruit from sun scald, but yet not so dense a foliage as to induce Oïdium or Black Spot. Look out for Red Scale on citrus trees, and cyanide to check same. Look out for fruit-fly in the early-ripening fruits, and gather and destroy all that may be so affected.

QUEENSLAND AGRICULTURAL JOURNAL

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Agriculture.

LUCERNE.

By PRIMROSE MCCONNELL, Manager Ruakura Farm of Instruction, N.Z.

(CONTINUED.)

Now as to cultivation: I need not state that this plant, like all others, will grow to greater perfection on some soils than on others; but I would like to convince every farmer present that the best soil is not imperative in order to obtain a successful stand, and that it will grow on almost any soil that is not water-logged, provided it receives proper treatment, particularly as to preparation of the soil and the selection of the best varieties of seed, and insuring the presence of the necessary bacteria. As to the latter, it has been proved beyond any doubt that a successful stand cannot be got except there is present in the soil certain bacteria which, if not present, must be supplied by artificial means. The bacteria may be applied, either through the medium of soil from an old lucerne plot or in a more condensed form, such as nitro-bacterine. On the whole, I consider the former plan is the safest, and the cost next to nothing. It has also been proved that an application of lime stimulates the action of the bacteria, and altogether makes success most certain.

A striking instance of the value of inoculation may be seen on the Ruakura Farm of Instruction, in a lucerne paddock laid down last November. The non-inoculated part of the paddock is an entire failure,

while the inoculated part is as good a stand as could be reasonably expected under the conditions. In this instance the inoculating soil was taken from a lucerne plot at the Moumahaki Farm, and applied at the rate of 3 cwt. per acre. A portion of the paddock at the Ruakura Farm of Instruction, which received a dressing of lime, but no inoculation, is also a failure, showing that, while lime may stimulate the action of the bacteria, it is powerless if the bacteria are not present. On the other hand, a portion which received inoculation but no lime is not such a success as the part which received both lime and inoculation, showing that the action of the bacteria was limited for want of sufficient lime.

Now, gentlemen, supposing that in laying down the above paddock we had ignored the value of inoculation, the result would have been complete failure, and the verdict: "Soil and locality unsuitable." I might also point out that the paddock in question would be generally considered to be one of the most unsuitable for growing lucerne, being poor in quality, receiving no preparation in the way of growing previous suitable crops, being close to the water-table, at times portions of the paddock under water, and the soil full of all manner of water-weeds. And yet the crop is so much of a success that I am thoroughly convinced that lucerne can be grown satisfactorily on much of the Ruakura Farm of Instruction soil, even if this trial ends in a failure. I am also convinced that on much of the Waikato land it can be grown to the greatest perfection.

I might just state here that the interest taken in the growing of lucerne by the Department of Agriculture is due to the exertions of the Director of Fields and Experimental Farms, Mr. E. Clifton; and for the work he has done, in this direction alone, no money could ever be considered a sufficient reward. When I laid down the first lucerne paddock on the Moumahaki Farm, under the directions of Mr. Clifton, I am sorry at having to confess that I did not receive any encouragement from neighbouring farmers; in fact, they all tried to convince me that I was "leading a forlorn hope." At the same time, I never saw any reason why the attempt should prove a failure, and the result more than justified my faith, the paddock being an unqualified success; so much so, that two Australian gentlemen, who had seen some of the best lucerne paddocks in the Commonwealth, and to whom I had the pleasure of showing the paddock, said that the stand was one of the best they had seen. Since that time, the present manager of the Moumahaki Farm, Mr. T. W. Lonsdale, has laid down a second paddock with success. I am also pleased to state that the success of the Moumahaki paddock has been the means of stimulating interest in the cultivation of lucerne; and that interest is now bearing practical fruit over the whole of the North Island. I am continually receiving requests for advice on this matter, and it is to me the greatest pleasure to provide all the information in my power, although I must ask you to bear in mind that I am still a learner myself.

Now, gentlemen, I think that the greatest lesson taught by experiments in the growing of this plant, and one which I cannot too strongly

impress, is that when failure arises it is due to causes for which, in nine cases out of ten, a remedy is available; and, if we cannot find the remedy just at the moment, depend upon it it is well worth our while to make diligent search for it. Probably the best preparation for lucerne is to grow some leguminous crop, such as peas or tares, and plough it under, or partly feed off and plough the remainder under. I may state that the latter was the plan adopted at Moumahaki. When dry enough, the soil should be repeatedly stirred during the winter and spring, in order to thoroughly aerate it and destroy weeds, numbers of which will germinate after each cultivation, and it must be remembered that for complete success it is necessary to have clean land. If the land is exceptionally weedy, it will be better to delay sowing until the warm weather comes, so that the germination of all weed seed is as complete as possible, and their destruction insured by repeated harrowings. As far as I am aware, sowing the seed in autumn has not been much tried in New Zealand, and I have no reason to believe that autumn sowing will not succeed, particularly on dry land. At the same time, if I were asked for advice on the matter, I would unhesitatingly advise to sow in late spring or early summer. As to manures, phosphates must always form the main ingredient, with the addition of potash on light soils, say, 4 cwt. of basic slug or basic superphosphate, 1 cwt. of bonedust, and 1 cwt. of kainit.

Readers of my report on the Ruakura lucerne paddock, which appeared in last month's "Journal of the Department of Agriculture," would no doubt be struck by the amount of manure applied; but this instance does not prove that such a quantity of manure is necessary to procure a stand—in fact, many successful stands have been secured with comparatively small dressings of manure. At the same time, failures on poor soils have often been converted into successes by nothing more than the application of an increased quantity of manure in the initial stage; and, at this stage, it is wise not to run the risk of spoiling the chances of success for want of a considerable outlay. However, I have no doubt the quantities of manure I have just quoted will be, in the average instance, quite sufficient.

Inoculating soil should be applied at the rate of 2 cwt. per acre (preferably on a dull day) just before sowing the seed, and be immediately harrowed in, as exposure to bright sun means death to the bacteria. If the soil is deficient in lime, I would advise an application of 1 ton of carbonate of lime per acre a month previous to sowing the manures, which latter may be mixed with the lucerne seed, and sown through the corn drill, with the coulters hooked up, the land being previously Cambridge rolled, the rings of the roller forming a perfect bed for the seed, which may be covered with a light brush harrow, and the whole again rolled. The mixing of seed and manures ensures even distribution.

As to the quantity of seed per acre, I have found 15 lb. ample; and, if the land is reasonably clean, I prefer sowing broadcast to sowing in rows, as the plants under this system cover the whole surface, and make a more effectual struggle against weeds. When the plants reach a height

of about 12 in., they should be cut over with the mower (taking care not to cut too closely), and the cutting allowed to remain on the ground as a mulch.

The greatest authorities on lucerne-growing recommend constant clipping during the first season, but always with the proviso not to cut too closely. Other authorities (who are in the minority) maintain that cutting during the first season injures the plants materially. My own experience is that cutting, if not too close, does not injure the plants, and also prevents weeds from seeding. If the plants at any time show signs of an attack of leaf spot, cutting will, as a rule, be the means of producing a healthy growth.

After the first cutting, the land should be harrowed by heavy, sharp, tine harrows, this process serving as a stimulant to the lucerne plants, and destroying many weeds at the same time. The following cuttings may be made into hay, or fed in the green stage to cattle.

A heavy crop during the first season should not be expected, although a small plot sown in December, in the poultry-yard at the Ruakura Farm of Instruction, has yielded four good cuttings, all of which have been fed to the poultry.

After the first season, it is a good plan to mow just when the plants are coming into flower.

When making hay, care should be taken not to expose the crop too long to the sun, as too dry hay means a great loss of leafage, which reduces the value of the hay very much indeed. When slightly wilted, the hay should be raked up and cocked where it is allowed to cure. As lucerne cocks do not throw rain well, even when well made, the American system of covering the cocks with caps is undoubtedly a good one; and in New Zealand, where the weather is very uncertain, I think the plan might well be adopted. This may seem a lot of trouble, but hay which is equal to bran, weight for weight, is surely worthy of considerable care, and you may depend that the average American is not the man to adopt any plan which does not mean an increase of dollars.

Good ensilage may be made from lucerne, but, like all leguminous crops, it makes ensilage of an unpleasant flavour.

When used as a soiling crop, the green stuff should be allowed to wilt slightly before feeding, otherwise there is danger of bloating.

Green lucerne is an excellent food for horses, as it is very cooling to the system when used with judgment. It creates a good appetite, and keeps all stock in a healthy condition.

From the dairyman's point of view, the value of lucerne is beyond estimation.

Many farmers are no doubt of the opinion that their soil is unsuitable, but my advice is: Give it a trial, no matter what your soil is like. If you choose the most suitable portion of soil that you have—a small area is sufficient for a trial—and spare no reasonable expenditure of time or money in the initial preparation, I feel sure that you will be more than satisfied with the result. I was lately asked to inspect a small farm which consisted entirely of poor gum land, and, after walking over it, I

asked the owner if he would try a small patch of lucerne if I sent him the seed and inoculating soil. This he agreed to do, and the plot was sown last March. Last week I had the pleasure of seeing the result, and so far it is highly satisfactory.

Now, gentlemen, just imagine what it will mean to New Zealand if we can grow lucerne on such soil; and I do not doubt for a moment that we can, for I feel sure that ultimate success on almost all soils is only a matter of a greater knowledge of the needs of this plant, and the production of varieties that will suit all localities.

I can assure you I feel it an honour to be immediately connected with the efforts that are being made by the Department of Agriculture in this direction, and to write (however imperfectly) what is, as far as I am aware, the first paper on this subject that has been publicly read before a representative gathering of New Zealand farmers; and, further, I am convinced that the growing of lucerne will bring more real prosperity to New Zealand than the possession of many goldmines and oilfields, although I am not inclined to underestimate the value of these latter. In attempting to write an article on this subject, I can assure you I felt my own inability to do it justice, and I am perfectly certain that nothing I have said in any way exaggerates the benefits that will accrue from the growing of lucerne.

I would ask the lucerne experts who are present to let me down lightly if I have made any grievous mistakes, remembering that the best of us have still much to learn, not only of this matter but of everything pertaining to agriculture. If, on the other hand, any farmer present thinks he may gain further advice by referring to me, he is heartily welcome to my services, which he may have, either through a personal visit or by correspondence.

I would also advise any gentleman present who is holding land for speculative purposes to get it all sown with lucerne as soon as possible, and by doing so he will not only confer an everlasting benefit on the whole community but will also increase his own profits a hundredfold.

In conclusion, gentlemen, many of you may possibly think that I have committed myself very strongly as to what may be expected from the cultivation of lucerne, but my own experience and the indisputable evidence of what has already been accomplished warrant all the statements I have made.

Previous to writing the foregoing paper on lucerne, I had not been able to find any evidence as to the effect of the lucerne roots on pipe drains. I find, however, that experiments have already been carried out in America to put this matter to the test, and it has been proved that the roots do not in any way block the drains, except when the latter come in contact with natural springs, which cause a flow of water all the year round.

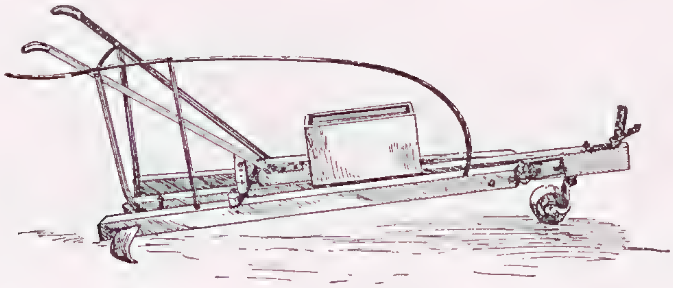
In the ordinary field drain, where the pipes are dry quite six months in the year, the roots give no trouble whatever.

It has been found that pure peat is the most unsuitable soil for growing lucerne.

THE CULTIVATION OF MAIZE IN QUEENSLAND.

HARVESTING.

Maize, in the United States, is harvested in a far different manner to the Queensland practice. There, the crop is saved for both grain and stover. Here, we allow the crop to get thoroughly matured and dry. Then the cobs are pulled off by hand and carted to the barn, after which the dry stalks are hoed down and burnt. I may here remark that when the Australian farmer talks of "cobs," he means the entire "ear," but the cob is really the pithy core to which the grains are attached. Therefore, the word "ear," meaning the entire fruit including the husk, is preferable.



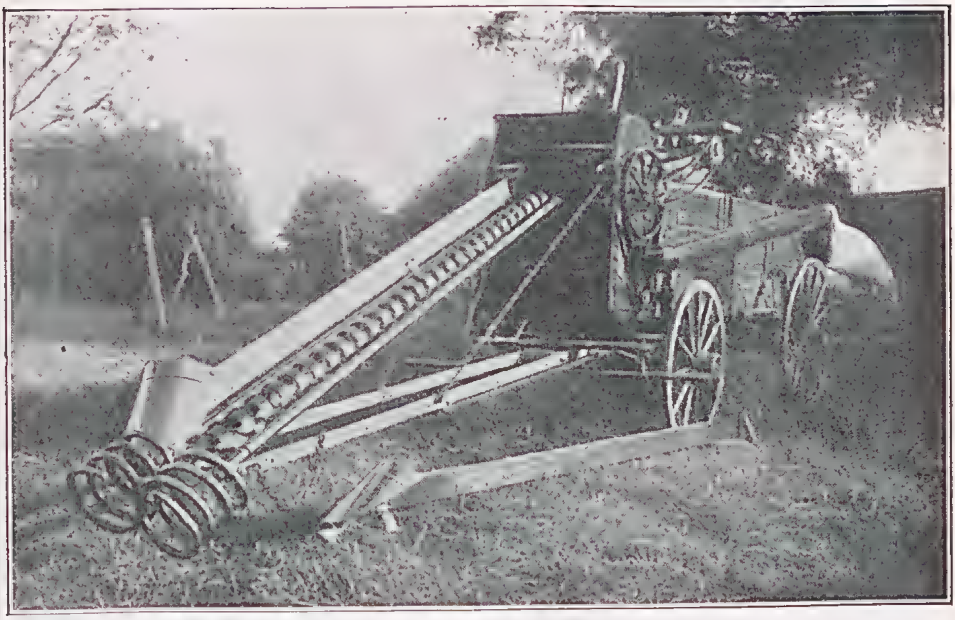
CORN HARVESTER.

In America the corn is cut before the ears are thoroughly ripened, or soon after kernels are well dented. The crop is cut, by means of a machine drawn by two horses, close to the ground by a combination of knives. The machine ties the stalks in sheaves, which are then stooked in the field, and left until stalks and cobs are thoroughly dry. Then the whole is carted to the barn-yard, the cobs (ears) are removed, and the sheaves stacked for fodder.

As soon as the ears are thoroughly dry they are husked and put through a cornsheller. There are machines which husk and shell in one operation, thus saving an immense amount of hand labour, and they are much used in Queensland, especially in the maize-growing districts of Killarney, Kingaroy, and Lockyer, where about 80 per cent. of the maize is passed through such machines.

A MECHANICAL CORN PICKER.

There is now on the Brisbane market a machine for picking maize, for which it is claimed that it does the work of six men in the field. It is obtainable at the International Harvester Company's stores, Roma street. It costs £75, and is said to do excellent work. The machine travels over each row of corn, drawn by four horses, and picks up the cornstalks, carrying them up to a pair of rollers, which snip off the cobs. The stalk, which is then released, falls through to the ground, whilst the cobs are shot into a receptacle at the other end. Although the price of the machine would prohibit its use on small farms, yet an owner could, besides using it for his own crop, hire it out to his neighbours, or take contracts, by which means he would recoup himself largely for the outlay.



STOOKING.

The stooking of corn plants was tried some years ago by Professor Shelton, the first Principal of the Queensland Agricultural College, but much loss of grain was occasioned by the depredations of field mice, for which reason, and on account of large areas of lucerne and other fodder being available for stock, rendering corn stores needless, the practice was abandoned.

DEPTH OF CULTIVATION.

Many comparative experiments of deep and shallow cultivation have been made, and, on the whole, the results are in favour of shallow cultivation. There are but few occasions when deep cultivation is preferable. If excessive rains have packed the soil, and kept it water-soaked, deep cultivation will help to dry and aerate the soil. Breaking the roots of the plants must be avoided as far as possible. If roots are broken, the plant will rapidly produce other roots, but it will be at the expense of the vitality and food supply. After the plants have reached the height of 3 or 4 ft., the soil, even in the middle of the rows, should not be cultivated deeper than 4 in., and 3 in. is usually better. For retaining soil moisture, a loose soil mulch 2 or 3 in. in thickness, should be maintained. Healthy maize plants will now be thick, strong, and of a dark green colour.

As to the number of times maize should be cultivated, the best advice is, that it should be cultivated often enough to keep down weeds and to maintain constantly a loose soil mulch until the plants have attained their growth.

Should rains occur weekly during the growing period, it will be necessary to cultivate frequently to break the crust which forms on the surface. On the other hand, frequent cultivations are not advisable

during prolonged dry weather. After a fine mulch of 3 in. in depth has been produced, frequent stirring is not necessary, except in so far as is required to keep weeds in check. The essential object of cultivation is to restore the soil mulch as soon after a rain as the condition of the ground will permit. If this time is allowed to pass, the crop will suffer, since the cultivation of hard, dry ground breaks it up into clods, allowing the air to penetrate to a greater depth, and so causing more injury than if such cultivation had not been given at all. If the condition of the soil demands it, shallow cultivation should continue, even though the corn is tasselling. Such is the advice given by the Kansas Board of Agriculture, U.S.A.

I have already mentioned the great value of harrowing the young crop. Professor C. D. Smith, of the Cornell Agricultural School, says that a long experience with the harrow, immediately after planting, demonstrates its value. The weeder takes the place of the harrow on light soils, but, for general purposes, the slanting-tooth harrow is the best to use. Harrow the field as soon as planted, to fill the marks made by the worker and planter; then reharrow every three or four days until the corn is 2 in. high. If you do not harrow as soon as planted, a rain may keep you off the field till the corn is up, when it will not do to harrow, because the little corn plants will be growing in the bottom of a furrow or mark, so that every lump of earth struck by the harrow will roll down on the corn and cover it up. The dragging will kill the little weeds clean into the hill, or in the rows if corn is drilled, and will save a great deal of expensive hoeing later, if the harrowing were neglected. Sometimes rains will prevent harrowing, and then the corn will have to be hoed to kill the weeds in and near the hills.

"The time for deep-stirring of the ground," says the 'Orange Judd Farmer,' is before, not after, the corn is planted. Plant roots do not go where there is the least opposition to their progress, so much as where there are the most food and moisture to be found. It has been abundantly shown (see 'Root System,' p. 13) that in search of water they will penetrate a rather compact subsoil for some feet. If the seed-bed has been properly broken up, the corn roots will pass readily through it to the end of the season of growth. Deep cultivation cuts the roots, and frequently, as when it is close to the plant, by cutting one primary root, it destroys a large root growth. Where there is sufficient moisture in the upper strata of the soil, which, be it noted, also contain the most available plant food, the roots of the corn remain near the surface, but as soon as there is a lack of moisture near the surface, the roots go almost directly downwards, until some reach a depth of several feet. If the moisture in the upper strata is increased, the roots will turn upward. Usually, in an ordinary season, the soil near the surface is moist and the roots do not penetrate deep. If, then, cultivation is close and deep, many roots are destroyed, and some have been led to believe that this induces the roots to go deeper. The error is easy, because, as all the roots near the surface are destroyed, after a time the only roots left are the deeper ones. Many of these roots even are cut by deep cultivation, and the effect is at once apparent. The sum of all this is to show that the objects

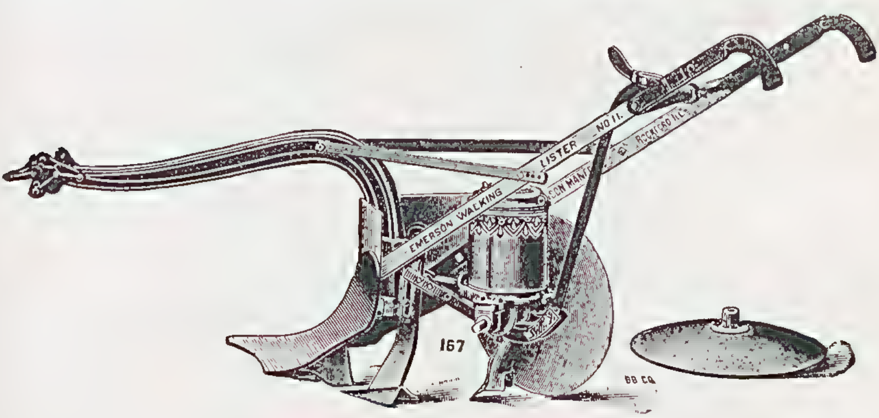
of cultivation are a mulch of fine surface soil, and the destruction of unprofitable growths. There is no need to stir the soil deep, to allow the roots to go deep, or to put the soil in condition to yield food. This has been already accomplished, and, as the plant's food must be in solution, that cultivation which will best conserve the moisture in the ground will best supply the plant with food. Hence, the increasing use of harrows and other shallow-working implements in corn cultivation.

Many years ago, one of the ablest farmers on Oxley Creek, the late Mr. Amos Radcliffe, made use of a shovel plough for the destruction of weeds in his corn field. He found, however, that this implement threw so much soil against the corn, that he gave it up as an implement which did more harm than good, not because of the shallow cultivation done by it, but because of the injurious effect on the plants owing to the mass of soil and weeds thrown on to the roots. All goes to prove that shallow cultivation of corn is followed by better results than deep ploughing. Still, says "Homestead," in a quarterly review of the Kansas State Board of Agriculture, "while this is true in a general way, yet it must not be understood that under no conditions is it a good policy to plough corn deeply. There are many instances where deep ploughing will give much more satisfactory results than will shallow. Where the soil has been kept, owing to heavy rains, in a saturated condition until weeds have made a strong growth, and have also compacted the soil in such a way as to leave it in a baked condition—in such cases it may be absolutely necessary to plough or cultivate more deeply than would be suggested by the correct theory of corn cultivation."

The foregoing remarks will suffice to give the corn-grower an idea of the correct methods of tillage—*i.e.*, ploughing, harrowing, and cultivating—as carried out in the greatest of all maize-growing countries—the United States of North America.

LISTING MAIZE.

This phase of the cultivation of maize has, as far as I know, not been adopted in Queensland, but in the drier prairie States of America—particularly Kansas, Nebraska, and Iowa—listing is general. The chief implement used is a double mould-board plough, called a "lister." It is



A TYPE OF WALKING LISTER.

worked usually by three horses, and throws the earth equally to the right and left. The implement generally has a subsoil attachment, a corn drill, and a contrivance for covering the seed. The lister cannot be used on unbroken sod land, but it may be used on other land without previous ploughing, usually without. It simply strikes out furrows 4 ft. apart, at the usual depth of ploughing, say, 6 in., and the soil thrown right and left covers the intervening unploughed space with fresh earth. At the same time the implement breaks up the subsoil, plants, and covers the grain. The great advantage from a labour-saving standpoint of doing all the work of ploughing, subsoiling, and planting and covering the seed at one and the same operation, is apparent. The following rough sketch of a field in cross-section will make clear the condition of the listed field after the plants are well up from the ground:—

The subsequent treatment of the field planted as above does not differ materially from that given the crop as ordinarily planted. Afterwards. the common two-horse cultivator is used, at first with a V-shaped box (A) about 3 ft. long, made of 2-in. plank, which moves with the implement, between the two cultivators, and prevents the earth as it falls into the furrow from covering the young plants. Before the field is "laid by" it is level as though the grain had been planted on the surface. This method is best adapted to level black soil lands.

EFFECTS OF LISTING.

The stalks on extreme left planted in ordinary way. Second, listed on prepared ground. Third, listed on unprepared ground. Fourth, ridged.

THE ADVANTAGES OF LISTING.

are:—

(1) Listed corn, having its roots in the deeper undersoil, is not affected by drought as that which is surface planted;

(2) The cost of growing the plant is reduced by from one-fourth to one-third;

(3) The listed field gives a larger yield than that obtained by the common methods of planting.

CORN STOVER.

The Australian farmer, unlike the American, takes little account of the "stover," or cornstalks. As soon as possible after he has "pulled" the corn, he hoes or ploughs out the dry stalks, and burns them. They do not appeal to him as fodder for stock, as they do to the American or Canadian farmer, who has a long severe winter to contend with when no crops are grown, and to whom, consequently, fodder of any suitable kind is of value to feed his cattle during the winter. In this climate we have crops of some kind growing all the year round. That great stand-by, lucerne, is always with us, and besides that, we have good winter crops of oats, barley, rye, wheat, mangolds, swedes, &c., even sugar-cane, and the careful farmer will have, in addition, many tons of silage for his dairy cattle. Hence our farmers grow maize, as a general rule, either for green fodder, silage, or grain—not for stover. If the grain, owing to dry weather, or from some other cause, at tasselling time, does not form properly, or is pinched, some may be fed to stock, or put into the silo, but the general bulk is allowed to go to waste, being ploughed out and burnt. Some farmers maintain that dry maize stalks are utterly valueless as feed for stock, and that the best use that can be made of them is to burn them in the field, where they provide a certain amount of plant food. Others admit that they have about one-half the feeding value of hay. The fact is that the feeding value of stover depends upon its condition when cut, on the quantity fed, and on the method of feeding, whether alone or in combination with other forage.

A large number of analyses of corn stover have been made, and experiments in feeding dairy stock have shown that stover rations have produced nearly or the same quantity of milk as the hay ration, the stover being equal in value to oaten straw. But, as I have already pointed out, stover in America and stover in Queensland are two very different things. The corn plant in the United States is cut while there is still nutriment in it and the grain is not fully ripe and hard. In Queensland the grain is allowed to become absolutely ripe even to threshing point, hence the stover is dry and cannot contain as much nutriment as the former. In any case, stover should not be fed alone, but in combination with some other feed, forming what is known as a balanced ration. Alone, it lacks the sweet smell and flavour of hay; it is also hard and tends to make the mouths of cattle sore, and for this reason they will reject it. During the big drought, ten or eleven years ago, I saw starving

dairy cows greedily eating old dry corn stalks, but it was a case of there being nothing else for them. Had they had access to sweet lucerne or oaten hay, these dry stalks would not have been touched.

In feeding stover, the proper plan is to chaff it, damp it to soften it, and mix it with other fodder and molasses, when the whole will probably be consumed by any stock. The only way to secure good stover is to allow the corn to stand in the field till the grain begins to harden, and the lower leaves are turning yellow. Then cut it and place in shocks of medium size, and let it dry out thoroughly, on the principle of haymaking. After that it can be stacked, and, as it retains some of its nutritive properties, it will form a good stand-by for stock. Running the crop through a husker and shredder is an ideal way of taking care of corn fodder.

CORN STOVER IN THE SILO.

We rarely hear of a maize-grower in Queensland harvesting his grain and then ensiling the dry stover. Some excellent samples of stover silage were made some years ago at the Hermitage State Farm. This was exhibited at the Bowen Park Exhibition of the Queensland National and Industrial Association, in 1903. The farmers who examined it thought highly of it, but being, as usual, averse to experimenting, the lesson was lost on the majority, and I have not heard of any subsequent attempts to make stover silage. Even if the maize is allowed to ripen, a crop of from 30 to 40 bushels of grain could be harvested, and the farmer would still get from 10 to 15 tons of good silage per acre.

MAIZE ENSILAGE,

Green maize makes, as everyone knows, excellent silage, and when grown solely for this purpose the seed should be sown in drills 4 ft. apart, and the plants 15 in. apart in the rows. Allow the maize to cob, and when the kernels have just reached the "glazed" stage cut for the silo. By putting it away too young, and before the plants have cobbed, the silage will be bad, and the silos filled with some tons of matter containing no nutriment, such as water, &c. If harvested at the proper stage, the amount of fodder per acre will amount to from 10 to 15 tons. Some varieties of corn do not mature until after the "glazing" point, but the observant farmer will soon learn to judge as to the best time for cutting, remembering always that immature corn usually results in sour silage, while fairly well matured fodder gives sweet, palatable feed.

According to some American experiments, corn rapidly increases in the total quantity of dry matter as it approaches maturity. These particular tests showed that the total amount of digestible matter was much greater when nearly mature than when cut earlier, and that the digestibility decreased at a slower rate than in the case of other forage crops. The total yield of digestible material, for instance, was thirty to thirty-six per cent. greater when the crop was fairly well matured than at silking time.

CORN VALUE INCREASED BY THE SILO.

The great value of corn silage is not sufficiently appreciated by the Queensland farmer, yet it has been abundantly proved that it has a greater feeding value than when it is fed dry. It is true that siloing does not increase the food content of the corn. No one can take more out of the silo than is put into it, nor even as much, but the increase in digestibility of the whole plant by reason of the heating and fermentation incident to siloing exceeds the loss of food value, so that there is a net gain. This gain is not much, according to *The Farmer.* It has been shown at several American experiment stations to be something like 10 to 12 per cent. This is not enough in and of itself to justify siloing the corn; but it must be remembered that these experiments have all been conducted upon the basis of the dry corn plant being cared for so as to lose as little as possible of its food value and palatability, and that it has been prepared and fed in the best possible condition for the cattle to get the largest benefit therefrom. It is stated in "The Book of Corn" that the North-western land in the United States carries more than 50 per cent. more cattle than it did before the silo came into use, and whatever the correct theory of the matter may be, the solid, hard fact is sufficient to satisfy us that very much more can be got out of the corn plant fed in the form of silage than when fed dry in any manner which is practicable with us.

Now I will digress for a moment and say a word about

SILOS.

At the present day the silo has been vastly improved upon. In bygone times, corn, sorghum, and other green crops were placed in a hole in the ground, and weighted with bags of stone or sand. Then simple wooden silos of various patterns were built, and these again have been superseded by the silo built of reinforced concrete. In former days the silage was kept compact by heavy weights. But this has been found to be unnecessary, the silage being merely covered with a thick layer of straw or other material. As to the size of a silo, a good dimension is 16 ft. in diameter and 30 ft. high, the capacity of such a silo being 119 tons. If the silo be 20 ft. high with a diameter of 20 ft., the content would be 105 tons, and an erection 30 ft. high and 18 ft. in diameter would hold 165 tons. As a general rule, two small silos are better than one large one, for the reason that every time the silo is opened there is danger of spoiling the silage, and then again, it is more convenient to fill a small one.

(TO BE CONTINUED.)

A NEW ARTIFICIAL MANURE.

The Acting British Consul at Christiania (Norway) stated in May last that the local newspapers published an account of a new kind of artificial manure which had been produced under the name of "bi-phosphate," said to be a by-product in the manufacture of nitrate of lime. On 6th July, the "Agricultural News," Barbados, referred to this

manure, a notice of which appeared in that journal for 11th May, and quoted the "Board of Trade Journal" for 2nd May, 1912, in which further information is given concerning the manure:—

A sample of this has been forwarded to England by the British Acting Consul at Christiania, and it is stated that the product contains 26 per cent. of phosphoric acid and 23.8 per cent. of nitrate of lime. Of the phosphoric acid, 92 per cent. is in the citrate-soluble form, which means that this proportion will dissolve in a standard solution of ammonium citrate.

The further statement is made that the manure will be placed on the market, in future, with considerably higher percentages of both phosphoric acid and nitrogen.

It is expected that the price of the new manure will be low; its chief use will be in the replacement of superphosphate and basic slag. It is manufactured at the Notoddin Nitrate Works, Norway.

RHODES GRASS.

The name "Rhodes Grass" has been applied to at least two members of the *Chloris* family, which has led to much confusion both among botanists and those who have given these two grasses practical trials in Cape Colony and New South Wales. Even Mr. J. H. Maiden, Government Botanist for New South Wales, fell into error, and for nearly a couple of years used the popular name of Rhodes Grass for *Chloris virgata.* Personally, I think the confusion in the names was in a great measure brought about by the fact that the late Mr. Cecil Rhodes, who took a keen interest in the introduction of new species of grasses and in agriculture generally, had seeds of the Sweet Grass of the Transvaal collected and sown in large patches on his estate, "Groote Schur," near Capetown. The grass did well there, forming heavy sods of good herbage, and the manager of the estate had the seed collected and distributed among the planters of Cape Colony, by whom it was naturally called Rhodes Grass. However that may be, it is now generally accepted that the botanical name of Rhodes grass is *Chloris gayana,* while *Chloris virgata* is applied to the Zoet or Sweet Grass of the Transvaal. A considerable amount of seed has been sold in Australia under the general name of "Rhodes Grass," and, taking into consideration the confusion that has existed in regard to nomenclature, it would be a hard matter, without a botanical examination, to say whether such seed is in reality *C gayana* or *C. virgata.*

The whole of the *Chloris* family delight in a warm climate, and may be found through the tropics in both hemispheres, so that it is doubtful if either of the two species under discussion would thrive in any but the warmer portions of this country.

Rhodes Grass was first introduced into New South Wales six years ago by Mr. Sylvester Brown, of Minembah, near Singleton. He raised a vigorous plot of it on his own property, and, besides freely distributing

seeds, according to Mr. Maiden, sold large quantities of it under the name of *Chloris abyssinica*. The Singleton district, it may be remarked, is not a place of high rainfall, and is considered rather cold in winter.

For the benefit of those who are unacquainted with it, I must state that Rhodes Grass is a hardy perennial of high feeding value, which on fairly moist land makes a rapid growth of 5 or 6 ft. in summer. Its stems run along the ground for several feet, and then grow upwards, rooting at the joints on the ground. Under favourable conditions, Rhodes Grass is exceedingly hardy, and will produce a large quantity of feed, and it will undoubtedly pay stockowners to give it a trial on suitable places. It is claimed for it by many who have tried it that it is highly resistant to drought.

Mr. C. T. Musson, of the Hawkesbury Agricultural College, supplies an interesting note in a recent number of the "New South Wales Gazette" on the seeds of Rhodes Grass. He points out that the flowers are small, and come away from the supporting stalks in twos and threes. If two, then only one good seed is usually formed. The seeds, which are remarkably small for the size of the grass, are spindle-shaped and reddish-brown, the weak seeds being short and whitish. In size and numbers they come near the seeds of the Poas, and, approximately, 400,000 plants may be obtainable from 1 lb. of seed.

In consequence of its having come so recently into cultivation, there is no guide in the use of this particular species as to quantity required for sowing. It is such a strong, bulky grass when well grown that there would seem little necessity to sow heavily; more particularly so, seeing its capacity for "running" and rooting at the nodes (joints).

The main difficulty in using a small quantity would lie in the cohesive property that pertains to the bulk sample. Experiments might be tried in the matter of mixing it with sharp, dry sand, or some one small seed, such as white clover or couch. Seeds used for such admixture should, however, have the germ killed by baking or otherwise, and should be carefully and thoroughly mixed with the Rhodes before sowing.

Ten pounds of this seed per acre would provide ninety plants per square foot. Half the quantity would do, provided a fairly even distribution could be obtained. This should be ample. In the long run, probably, only half a dozen would live on that area, those getting the best start providing all the successful plants; those coming on later would be smothered out by the earlier ones overshadowing them. Still, it is necessary to put in much more seed than is actually required.

Rhodes Grass should be sown with caution, for its creeping habit of growth might prove troublesome in certain situations, and its general suitability to our climate has yet to be proved. But, like many other grasses, the best thing for every farmer to do is to test it on his own land in a small experimental plot, when he can soon decide from personal observation whether it is a grass that will prove profitable to grow.

It has been stated by those who should be in a position to know that *C. virgata* is a far better grass than *C. gayana*. It is a strong grower, yields heavily, is succulent and palatable, grows in a dry season, and is said to be less affected by frost.

As a sub-tropical grass, requiring warmth to germinate it, the seed should not be sown till late in spring, and where small areas are to be dealt with it is better to sow in seed beds. The seed should be sown on the surface and patted down with the back of a spade, and in six or seven weeks, according to the weather, the young plants will be strong enough to put out in their permanent situations.—"The New Zealand Farmer, Stock and Station Journal."

THE FARMER'S SHEEP.

By W. G. BROWN, Sheep and Wool Expert.

In Mr. J. W. Matthews' "Crossbreeding of Sheep," issued by the Department of Agriculture, New South Wales, the results of a series of experiments are given which are valuable to Queensland farmers and to Australians generally.

Queensland's physical and climatic conditions are similar to those of New South Wales, with the added advantages, in our case, of having fewer sheep diseases and, especially on the Downs, of a better rainfall.

Among the very interesting experiments made by Mr. Matthews, those concerning the early maturity of crossbreds hold much significance to us who are on the threshold of a very big and lucrative business—lamb-raising. In Table III., for instance, he shows seven breeds which he has crossed on the Lincoln-*cum*-Merino ewe. He has taken 49 lambs, and gives the weights at 16 months as follow:—

Breed.	Ewe.	No.	Weight.	
			lbs.	ozs.
Cotswold	Lincoln Merino	7	64	6
Border Leicester	Lincoln Merino	7	71	9
Cheviot	Lincoln Merino	7	56	7
South Down	Lincoln Merino	7	71	15
Shropshire	Lincoln Merino	7	78	13
Hampshire	Lincoln Merino	7	73	3
Dorset Horne	Lincoln Merino	7	84	12

This table shows that Dorset Horn gets the heaviest lamb at 4 months, Shropshires being a good second. On page 79, Dorset Horn again appears as getting the earliest maturing stock, for at 17 months there is an animal shown as weighing 124 lb., the Shropshire below weighing 111 lb. 4 oz.—the Dorset having well kept its lead.

Besides the above table, there is another return given, which is most instructive, concerning a shipment of 221 lambs to London, whose composition and life history is well known. On page 88, Mr. Matthews says: "These lambs were not specially selected, and, as their mothers had lambed on dry feed, they were not up to the standard of former years."

In the history of this consignment, another matter was dealt with other than the values of the different crosses; and that was, the amount of waste which takes place when sheep are taken from their pastures and sent on a long journey to, say, the metropolis. This particular lot of

lambs was weighed at Wagga Farm, and on arrival at the freezing works was carefully weighed again. The lambs had been slowly driven the 3 or 4 miles from the farm to the railway station; and the result is shown in a table (page 87) as follows:—

Cross.	No.	Average Live Weight.		Average Dead Weight.		
		At Wagga.	At Young.	Dressed.	Fat.	Frozen.
		lb	lb	lb oz	lb oz	lb oz
South Down + Lincoln Merino ..	32	67	58	31 13	3 9	29 14
Shropshire + Lincoln Merino ..	71	68	63	32 7	3 13	30 8
Hampshire + Lincoln Merino ..	31	70	64	33 0	3 5	31 1
Dorset Horn + Lincoln Merino ..	47	78	67	35 10	3 10	33 11
Border Leicester + Lincoln Merino	40	71¼	62	33 0	3 0	31 6

An average loss per head of a trifle over 8 lb. The Shropshire Cross came out best with a loss of only 5 lb.; while the Dorset Horns lost 11 lb. Of course a certain proportion of this loss is due to excretions, but what that proportion may have been is not shown in this case.

On page 115, however, Mr. Matthews states that, in a former test of sheep leaving Wagga and Bathurst for Sydney, the time occupied from pasture to butcher being 44 and 24 hours respectively, the average loss for each consignment was 9·57 lb. on the Wagga lot, and 7·6 lb. on the Bathurst lot—a general loss of about 8 per cent. It does not necessarily follow that the sheep lost tissue or fat. They were weighed off the pasture when full. A former trial at Wagga showed, after the animals were kept 15 hours without food, an average loss of about 6 per cent. in weight. These last were two-year old sheep weighing from 150 lb. to 160 lb.

To return to the shipment of fat lambs mentioned above, a summary of the London agent's report shows that, generally, the South Down were best in quality and Dorsets best in results. The average net proceeds per lamb was 7s. 3d., the gross value being 12s. per head. Owing to superabundant supplies, the market was quite 1½d. lower per lb. than the average for previous years. Thus, if the extra 1½d. had been received, the lambs would have returned a further 4s. 6d. per carcass, or an average of 12s. per head net.

The South Downs brought the highest price per lb., and the Dorsets averaged 7½d. more per carcass, due to their greater weight of mutton, wool, and skin. Further experiments show that the Dorset Horn is a very early maturer. The lambs were from 4½ to 5 months old; the cost of marketing in London, 4s. 10d. per carcass; the Shropshire sold well up, and wasted less from the farm to the freezing chamber. The Border-Leicester ran the others very closely. The gross price was 4¾d. per lb., and the net price a little over 2¾d. per lb. The usual net price is 4½d.

It seems that, from that trial, the Dorset stands out as the most payable sheep, South Downs next, Shropshires and Border-Leicesters close up. But—that is one experiment, where hundreds are necessary,

under every variety of conditions of climate and soil. What may be good for Wagga may not stand good for, say, the Darling Downs. The Dorset Horn, for instance, claims precedence on its extra weight of carcass and skin; yet increased relative weight of carcass may not always mean best price. In last year's Sydney Show, there was a striking instance of that. Four-toothed half-bred Lincoln-Merino wethers looked very well, and, on being killed, dressed 83½ lb. out of 145 lb. live weight; yet at the public auction of fat sheep, the South Down-Merino half-breds, dressing 63½ lb. out of a live weight of 115 lb., brought 14s. 6d., the Lincoln-Merinos bringing 12s. 6d., although 20 lb. heavier than the South Downs.

The Suffolks were not tried in the London experiment; but at Glen Innes State Farm, the manager reported on these sheep some time ago:—"Lincoln-Merino and Suffolk-Merino were tried recently, five lambs of each being taken and weighed in December; each was 1 month old. The Lincolns were behind in gross weight by 4 lb.; and, when weighed two months later, were 6 lb. behind, the Lincoln-Merinos weighing 277 lb., and the Suffolks 307 lb. The whole of these ten lambs were dropped about the same time. A Suffolk-Merino (ewe) lamb weighed 64 lb. at 3 months, and 78 lb. at 4 months."

One lamb of each of these crosses at 4 months was killed, and the dead weight of the Lincoln-Merino was 32 lb., and the Suffolk-Merino 40 lb. The mutton of both these proved to be excellent. The Lincoln-Merino was the better fleece producer, its wool being worth 6s. 1½d., as against 5s. 2d. for the Suffolk-Merino.

The fecundity of this breed is very high. According to the Suffolk stud-book, the average percentage of lambs for sixteen years was 132·97 per cent. In Riverina, Mr. Jackson's small flock showed—7 ewes, 15 lambs. In the same flock two lambs killed at 16½ and 14 weeks old dressed 47 lb. and 37 lb. respectively.

The wool of the Suffolk, however, is very inferior to that of most breeds. It is essentially a mutton sheep. I saw one ram, which showed every sign of maturity, yet examination of his mouth showed he could not be more than 8 months old. This breed is certain to make its way as a farmer's sheep when better known.

The Border-Leicester has a very good claim for a position as a second-cross sire. Some very fine animals were to be seen at the Brisbane Show. Messrs. Hortnell and O'Rourke, Logie Plains, and Mr. Mayall, of Pittsworth, showed a number, and personal inspection showed a lustrous, beautifully true wool, with marked character; and, a tribute to their fecundity, one ewe lambed twins in the pens. A visit to Logie Plains, where Mr. Hartnell's flock was lambing, was a revelation. On a field of Italian rye grass a mob of ewes were running, and of a good many I could only see one or two ewes with "singletons." The rest had twins, and in two cases brought under my notice—triplets. Mr. Mayall, too, informs me that they are a very prolific breed, and very much earlier maturing than his other sheep. I understand that in New Zealand they are highly prized as sires for the second as well as the first cross.

[TO BE CONTINUED.]

EXHIBITS FROM THE AGRICULTURAL COLLEGE, GATTON, AT THE EXHIBITION OF THE NATIONAL ASSOCIATION, AUGUST, 1912.

One of the most important exhibits, perhaps, from a producer's standpoint, was the display of "stack silage" and the samples of ensilage taken from three different types of overground silos and one from a pit, representative of 376 tons of conserved fodder made during March, April, and May this year. Every newspaper which devotes itself to shaping the destinies of "the man on the land" is always emphatic on the value of silage; and if there is one thing more than another to form a fitting subject on which to preach a gospel to the dairyman, it is this. Here it is called "The Dairyman's Salvation." Sceptics are yet to be found, and many still have the idea that ensilage-making is a risky business; but it is about time, considering that the art of storing fodder in this way seems to have been understood over 2,300 years ago, that the sceptics should be confounded. In Xenophon's "Anabasis" (400 B.C.), we are told that in "The Retreat of the Ten Thousand" over Kurdistan and the highlands of Armenia, the Greeks discovered stores of grains and fodders buried in pits, so that the antiquity of the practice is undoubted. Why is it that so many are still content to let the other fellow go in for the so-called luxuries in the way of silos, and be satisfied that the grass is good enough for *his* cows, and when they go off their milk, turn them out—they don't pay to milk? Others grow green crops, and may let the cows do the cutting: a good plan, forsooth, when labour is so dear! Talk silos to them. "Too expensive," 'tis said; but what of the stack. Farmers, make up your minds—those of you who have not silos, of course—have a try at a stack, and the very act of trying soon results in another convert. Perhaps a good many have tried stacking; but how? It's all very well to quote the old saw, *Labor vincit omnia;* but mix up a bit of common-sense with it, and success is assured. Given the fodder crop in a suitable stage of growth, the matter of attention to a few details is all that is needed. One must take into consideration, when stacking a mass of fodder in a green state, that the chemical and biological changes occasioned by the processes of fermentation are going to be more uniform when an atmospheric pressure of 15 lb. to the square inch, and incidentally the process of combustion, is guarded against as far as is possible. How is it to be done in the open air? Plenty of dead-weight pressure; shovel up a bit of mother earth. Plenty of people will tell you that they have made good silage in a stack without any pressure at all. Quite correct, but they would have had less waste if they had "weighted" their stack. Adhere to the rule: The coarser the fodder, the greater the amount of dead-weight pressure required. Not by means of any mechanical contrivance. Oh, no! The modern method of a series of wire ropes placed over a stack, a pair of ratchet drums with an engaging paul, and a lever to operate them to tighten the ropes is not necessary. Don't go to this expense.

Here's the scheme:—Save cartage by building your stack right alongside the growing crop. Save bursting yourself by having to lift huge armfuls of fodder on to a dray or wagon, and then again on to the stack. It wants a man with a heart the size of a bullock's to tackle it in this way. Make a few rough bush sledges; load the fodder on to them, on top of a series of short rope slings. Haul to the stack, and hoist the bundles (as soon as it becomes too high to build conveniently from the ground) by means of an ordinary whip hoist. Maize planted a little thickly in drills is one of the best things to grow. You want to cut when the stalks are soft and succulent, and the grain in the "milk" stage. Keep the stalks as nearly as possible parallel in the bundles. When sown in drills, it is easier to cut the crop. There are many methods of harvesting. A sledge fitted up as a "cutter" with a short length of stout scythe blade projecting about 10 in., and set back at an angle, will slice off the stalks rapidly as the sledge is drawn between the rows. Fix a guide rod so that the crop may be laid down evenly, and it can then be gathered readily into bundles.

HOW TO STACK.

Select a dry spot of ground and build a long and fairly narrow stack. Construct a framework of bush poles 13 ft. high, planted firmly in the ground 4 ft. apart along the sides. Fix top plates at the top of the uprights, and twitch them on with wire, and brace across similarly at ends and in the centre. One short length of top-plate should be made movable so that it can be kept low down at first to allow for the travel of the "whip," and gradually moved upwards as stacking is proceeded with. Before commencing to stack, place a layer of about 6 in. of waste grass on the ground. The capacity of stacks may be estimated by allowing about 50 to 56 cubic feet to the ton when consolidated.

Start stacking on the grass, and, here's the gist of it: *Keep all the stalks laid the one way.* Transverse layers admit air far too much into the mass. Place the tassel end of the maize at least 3 ft. 6 in. over at both ends of the stack. When a height of about 5 ft. has been reached, lay down a board flush with the outside pairs of uprights and trim off the projecting ends. Repeat the process. Keep a good camber in the centre of your stack, as heating soon causes abnormal settling there. Use judgment when binding the layers back so as not to have any bumpy joints where the laps come, and be sure that care is taken along the sides to place fairly straight stalks down against each pair of poles, and here the laps must be very carefully watched. Trimming the ends ensures a consolidated section exposed to atmospheric influences, but the carefully concealed overlapping of the stalks at the sides keeps the air from penetrating; and the more the air is kept out, the lower the percentage of loss. Settling takes place rapidly as soon as the mass begins to heat. It is a good plan to throw wires over the stack at night time, and weight them temporarily until the next or following morning with logs. Remove and continue stacking. Be sure to have a wire close to each end where trimmed off. Do not worry about temperatures; expel the air, and these are reduced. More material does

this of itself as stacking proceeds. Allow a big margin for settling. When finished to a full camber, spread on top some green grass or other close-textured weeds or waste; water this well, and cart and spread a layer of soil on top, averaging from 12 to 18 in. in thickness. Round it off neatly in the centre to turn the rain. If one is fond of having things look nice, top off with grass built with a full eave. Pass wires across and weight to hold the grass in position. Unship the framework as soon, as the stack has settled down. Farmers, you will then have a store of succulent fodder costing only the labour involved in putting it together, and the percentage of loss should not be more than 8 or 10 per cent. The sample on exhibition had been ten weeks in the stack. When about to use silage from a stack, a depth of several inches will be found to have moulded at the ends through contact with the atmosphere. Trim this off, and then cut down a narrow "bench" from top to bottom. The covering of soil on top keeps the rest safe from the weather. Better results are obtained by chaffing the silage before use. A handy method to provide for feeding-out is to make receptacles out of ordinary 4-bushel sacks strung on No. 8 wires. Pairs of uprights, securely braced, are put in for the purpose, and the wires strained. Intermediate supports are also required to prevent sagging, and spreaders should be put in to act as braces for each individual pair.

SILOS.

The samples of conserved fodder were taken from several sources—one from a pit, 27 ft. deep, cut out of sandstone formation. This pit is situated in one corner of a hayshed, and, when full, can be covered over with hay; and in this way additional storage space is obtained under one roof. A pit in a well-drained situation, where there is no seepage, is quite effective; if the sides are rough, air is admitted and a slight waste is unavoidable. The pit has been filled with lucerne containing some foreign growths which would have rendered it unfit for making good hay, and with chaffed sorghum and maize, the latter, being a good crop, was frosted slightly, but, when chaffed, resulted in good silage. Another sample is from a "Cherry" type of circular silo erected as an experiment to test the efficacy of a galvanised-iron lining attached to a timber framework, the iron having a protection of a non-corrosive substance. It can be emphatically stated that unless the iron is lined again on the inside with a Portland cement compo. 1 in. in thickness, and reinforced with 1-in. mesh wire netting, as found necessary in this and on other occasions where readily corroded linings are adopted, it is an unprofitable class of silo to build, as its life is not only short, but the timbers, as placed, are readily attacked by white ants. Another sample is taken from what was originally a timber-framed octagonal silo lined with fibro-cement lining, but which now has an inner lining of 4 in. of concrete. This silo was built specially to test the sheets of fibro cement as a lining, but they proved too thin and were unable to withstand the pressure and heat of the ensilage. The material, if thick enough, is a good non-conductor of heat, but now that

timber is so dear a costly wooden structure is unavoidable, and it is more satisfactory to adopt a reinforced concrete silo in preference to any other type.

REINFORCED CONCRETE SILO.

The construction of this class of building presents no difficulties to a man with some knowledge of concrete and an aptitude for the use of the plumb-bob and level. Nothing can excel a monolithic structure of this character for the purpose. The Department of Agriculture will send suitable moulds, free of cost, except freight and handling, to farmers who are prepared to erect this type of silo, and provides also suitable plans and specifications. Where sand and gravel of good quality are obtainable for the carting, the cost of all materials and the erection of the silo should not exceed £1 per ton capacity, and a good many silos have been built for less than this. The results from this year's filling, in March and April, have been all that could be desired, and Queensland farmers can approach this subject with a feeling of security and confidence in its application.

DAIRY PRODUCTS.

The varied samples included in this exhibit were only recently manufactured, and, for this reason, have not yet had time to thoroughly mature.

The dairy itself is a small and compactly disposed building, recently erected in accordance with specifications drawn up by the Departmental Surveyor, Mr. A. Morry, the work being subsequently carried out under the same officer's supervision. It is now possible to afford to the students at the College a good general education in factory work under a qualified instructor. The arrangements for conducting the work are as follow:—Electric power is supplied to a 12-b.h.p. motor from a central power-house, where a 45-b.h.p. suction gas plant is installed. The motor operates a 4-ton Waugh and Josephson compressor and the necessary circulating pump, also subsidiary shaft from which the combined "Simplex" churn and butter worker is driven. A 4-h.p. vertical steam boiler supplies the necessary power for driving milking machines by means of an ejector fitted to the boiler, a turbine separator, and a small bottle-washer. Steam is also supplied for washing and sterilising cans, and for a number of minor purposes. The testing-room is fitted up with a 24-bottle turbine-driven Babcock machine. Manufacturing and insulating rooms are provided for cheese and butter, and an insulated cold-room for meat. Butter-making is scientifically controlled by means of lactic acid starters prepared, in the first place, at the Stock Institute at Yeerongpilly. With the aid of the apparatus at hand, it is possible to determine the amount of moisture in each output of butter five minutes after it leaves the churn: the copper-lined evaporating ovens are readily heated by steam to a temperature of 250 degrees. Fahr. In the manufacture of cheese, it is now possible for the operator to "work" the milk rather than let the milk "work" him, and progressive tests go hand in hand with each stage of manufacture. It is unnecessary to enlarge on

such well-known classes of cheese as "Cheddar" and potted "Stilton," to be seen at the College exhibit, as such "delectables" are well-known commercial articles. A matter of interest, however, are a number of soft palatable "Port du Salut" cheeses made up in brick and other fancy shapes, representing a type of fresh cheese very much in favour throughout the principal cities of North America. Another feature, and an important one nowadays when cheaper foods are demanded for the masses, was represented by a number of skim-milk cheeses. A very profitable business concern is unfolded when it may be stated that skim milk as a by-product is valued only at the rate of ¼d. to ½d. per gallon, and this quantity of milk when used for manufacturing skim-milk cheese will produce commercial cheese to the value of 4d. per lb., the present value of full-cream cheese being 9d. per lb. The sample bottles of pasteurised milk were put up with the object of illustrating part of the modern method adopted for the supply of hygienic milk to consumers. It is generally admitted that the process, when effectively carried out, reduces the chance of introducing harmful bacteria to the human body to an infinitesimal degree, and the public, when educated to the advantages of the system, would not readily be content with the out-of-date methods still in vogue.

BACON TROPHY.

Dairy produce and pigs are inseparable. Here a quantity of bacon was on view representing pigs of different ages and breeds, rather than as a sample of what the trade regards as a *sine quâ non* of a bacon pig. Purebred Berkshires and Yorkshires were represented, also the Berkshire-British Black cross. *Re* the former—their popularity is unassailed, as the best specimens of the breed feed up to an ideal bacon pig at six months old and suit the conditions of the Queensland trade admirably. There is, however, always some room for an assertion that both breeds err on the side of shortness of flitch in comparison with first crosses of both with the British Blacks or Tamworths. The Berk-British Black cross has its exponents, and it is argued, amongst other things, that the Berkshire "comeback" gains something tangible in the making. One thing can always be said about these crosses—viz., that they die better than they look. Unfortunately for the farmer, he may have to suffer a depreciation in price through raising a lengthy-looking, narrow animal with less developed hams and an unattractive appearance, when compared with its other English cousin, the "nattier" symmetrical Berkshires and Middles Yorkshires.

FARM.

The display of agricultural products shown by the Queensland Agricultural College enabled the visitor to the National Show to form an idea of what can be produced at an institution such as this, and the

advantages that the students derive from a practical training in scientific and up-to-date agriculture.

Although the College has during the past twelve months passed through a period of drought, the samples of produce exhibited little of its evil effects, and, although the College is possessed of a fine irrigation plant now electrically driven, irrigation is not resorted to unless under conditions which render it absolutely necessary.

Between the months of September and December of last year, the College was forced to rely a good deal upon artificial watering, and the results obtained were highly satisfactory.

During those months, when agriculturists in the surrounding districts were crying out at the shortness of fodder supplies, the College lucerne paddocks, where irrigated, were knee deep in succulent growths of lucerne. Practically, these paddocks were the only green spots to be seen for miles, and were the admiration of those who visited the institution during the period mentioned.

The exhibits shown, however, were not the result of any artificial system of supplying the necessary moisture, but have resulted from careful cultivation later on in the season.

Forming the background of the four bays which made up the main portion of the College exhibit, samples of different fodders, grasses (both natural and artificial), and cereals were to be noted.

Here was to be seen the latest addition to fodder plants—Indian Cow Cane. This is a fodder which undoubtedly has a great future before it. Although not entirely a frost-resister, still it will stand a lower degree of temperature than maize or sorghums, and has the advantage of remaining green and succulent when our natural grasses are of little practical value.

Resembling the sorghums in fineness of stems, it naturally lends itself to the requirements of the dairy and stock farmer.

The Panicums play a prominent part in the College exhibits, samples being shown of White, Common, and Japanese, in chaff, hay, and silage. As fodder plants they are, perhaps, among the first in order of merit, responding as they do to heat and moisture; of rapid growth, making an excellent silage crop and a useful class of hay.

Various kinds of millets and sorghums, oats, wheat, and barley, both in the grain and straw, were on view. Four tiers arranged in octagon shape formed a trophy of the various sorts of agricultural seeds, ranging in size from the tiny Dutch clover to the broad field bean; the whole forming an object lesson of what can be produced in one district of Queensland.

The hay trophy comprised different-sized bales of lucerne; White, Japanese, and Common Panicum; Oaten and Wheaten Rhodes and Sago

Grasses; Field and Cowpea Hay. Samples of these were also shown in chaff.

Several varieties of maize were exhibited, both in the cob and threshed, amongst which are Golden Beauty, Long American, Yellow Dent, Balderman, Hickory King, Loveday's Imp.

Broom Millet—a crop to which sufficient attention has not yet been paid by the Queensland agriculturist—occupied a place amongst the exhibits, samples of hurl, cover, and inside grades being shown in the hackled stage, also baled for market. This is a crop which is well worthy of the attention of the scrub settler with a family; the labour required in its harvesting and treatment being such that it could be dealt with by women and children.

Cotton, which will no doubt in the future play a prominent part in Queensland agriculture, was exhibited in the form of a pyramid, showing the ginned cotton of several varieties. Separate samples of each of these were grouped at the base of the pyramid, amongst which were—Towers Triumph, Towers Special, Kidney, Texas King, Russell's Big Boll, Simpson's Prolific, Jeonavitch, and Upland. So far, the variety known as Towers Triumph has given the best results at the College, yielding over 13 cwt. per acre.

KITCHEN GARDEN PRODUCTS.

For garden products the season was late as far as the College was concerned, as two successive crops of cauliflowers and cabbages had already been raised, with the aid of irrigation.

Unfortunately, the kitchen garden is usually relegated to the background on the average farm, as other pressing work has to be given precedence. However, with the aid of such excellent tools as are obtainable of the Planet Junior type, the laborious work of cultivation is now a matter of pleasant exercise and a joy to the grower, who will find it a profitable undertaking and a great assistance in reducing the inroads on the flour bag and the beef cask.

The exhibits were of a varied character, and illustrated a phase of market gardening as carried on at the institution.

POULTRY.

From the few eggs on view it was not possible to gauge the extent of this section at the College—where each year an egg-laying competition is held—where 30 pens, each with 6 pullets, are now undergoing a comparative test. Birds are sent to compete from as far south and north as Adelaide and Cairns respectively. Quite a number of different breeds of fowls are kept on the place, and the popularity of the Gatton birds is assured, as every endeavour is made to keep the standard of quality up by importations and, by selecting, to breed utility types.

SUBSOILING WITH EXPLOSIVES.

Mr. J. A. Hamilton, of Tolga, North Queensland, writing on this subject, says:—"We have used explosives for stumps as well as in tree-planting, but found that gelignite is not good for blowing stumps out of the ground, some being merely burst so that they burn easily. Of course, if they could be lifted out of the ground, it would be better, especially in forest country already deficient in humus. In clay lands, burning the stumps out after blasting ought to be preferable, as it would help to ameliorate the stiffness of the clay. I knew of explosives being used in California twenty years ago in planting vines and olives. I find it especially beneficial to mango trees in our volcanic forest soil here. For subsoiling this class of soil, the charges would have to be 10 ft. apart to do any good. I noticed that a correspondent of the Journal mentioned 40 ft. apart (Mr. Howard, Indooroopilly, recommended from his experience 20 ft.—ED.); that distance would be useless here (Tolga). For fruit-tree holes, we jump a hole down 4 ft., slightly sloping, and use a plug and a-half of gelignite. I always remove a foot of the surface soil first, in order to save fuse. Of course, on a larger scale, firing by electricity is a lot better, and saves so much fuse. Have you any idea how much one of these electrical machines cost for firing explosives?"

[There are two electrical batteries obtainable in Brisbane, from Messrs. Trackson Bros., electrical engineers, Brisbane. One will explode 5 shots at a time, the other 10 shots. The cost is for a 5-shot battery, £4; for the 10-shot, £5. The other material required is:—Exploder, 6-ft. wires, £1 2s. 6d. per 100; insulated lead wires, 2 coils, say, 3/22, each 110 yards, 15s. per coil. There is also a cable reel for winding up the wires, which may be used instead of coiling up to cable, costing £1 5s. 6d.—ED.]

WATER SUPPLY TO FARMS.

By ARTHUR MORRY, Surveyor, Department of Agriculture and Stock.

THE COLLECTION AND STORAGE OF RAINFALL.

[CONTINUED FROM PAGE 25.]

A very economical weir may be constructed across some gullies, of hardwood timber, which will be effective for quite a long time, if the timbers are protected by a good coating of tar or other preservative.

The idea is suggested by an American paper, and has been amplified somewhat and made to suit local climatic conditions. The sketch illustrates the method of construction; and any farmer skilled in the use of tools, with the assistance of a few farm hands, will be able to construct the same.

Assuming the gully to be 10 ft. in width at the bottom, the crest of the weir 10 ft. high, and the width of the gully on a horizontal line at the crest 30 ft., the construction should be proceeded with in the following manner:—

The logs selected should be sound and straight, not less than 10 in. or 12 in. in diameter, and known to stand well in damp soil; longitudinal trenches should be excavated in the positions shown, and foundation logs (A), well tarred with hot coal and pitch, laid in the same, and bolted with 1 in. bolts, nuts, and plate washers to sill pieces (B) let in and laid across same; sill pieces should extend well into the banks on either side; large boulders in trenches should be removed, and trenches levelled up with hard material, so as to form a firm and level foundation for main logs. The posts (C) should not be less than 12 in. in diameter, let 3 ft. into the ground, at distances not exceeding 4 ft. apart, halved into solid log plates (D) at top, and bolted with 1 in. bolts, nuts, and plate washers; the raking bearers (E) to be not less than 10 in.

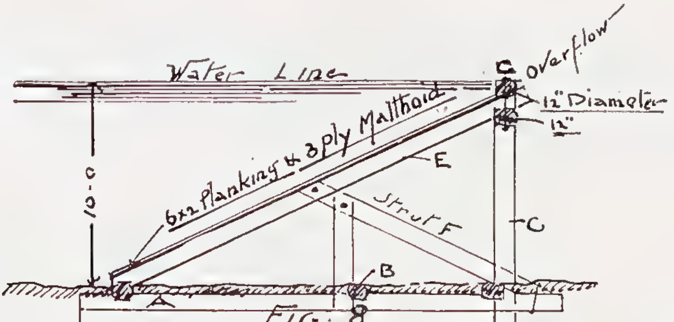
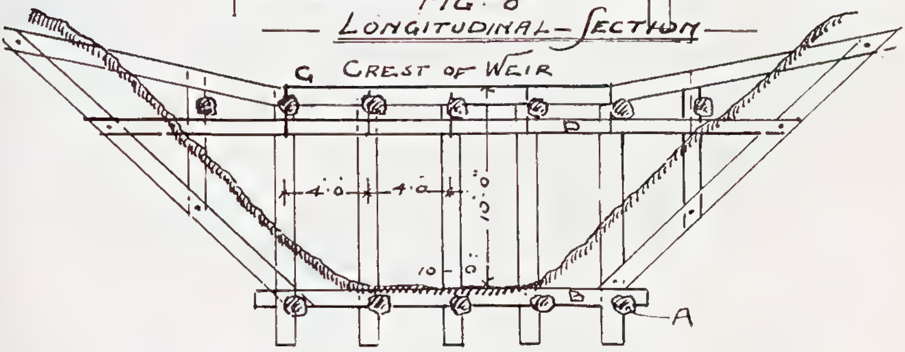


FIG. 8
LONGITUDINAL—SECTION



—FIG. 7.—
—SECTION ACROSS WEIR—

diameter, bird-mouthed, or halved into sills, top plates, and struts, and well bolted as before; struts (F) and supports to same to be not less than 10 in. diameter, checked into and bolted to plates as shown; top plate (G), forming crest to weir, to be 12 in. diameter, halved and bolted as shown, to rise on each side 2 ft., and to extend into bank 3 ft. on each side, halved and bolted to all upright posts; a 10 in. log (H)

to be let into the bank on each side on same rake as (E), to carry ends of sheeting planks; all sills, plates, struts, and bearers to be adzed to line, cut, mortised, halved, and bolted solidly together; all joints to be coated with hot tar before bolting up.

The whole of the slope is to be sheeted with 6 in. by 2 in. sawn hardwood planks laid close together, and well secured with 6 in. spikes; the sheeting to extend into the banks on each side and vertically in front of top plate and crest log; all timbers, including sheeting on slope and where in ground, to be twice tarred with hot coal tar, with 1 lb. of pitch boiled in each gallon of tar.

Cover the whole face of slope with 3-ply malthoid or other suitable bituminous material in sheets or rolls, extending 2 ft. into the banks on both sides, 18 in. into the ground at toe of weir, and over and round the crest log; joints to be neatly made with special cement sent with the rolls, tacked carefully, and laid as directed; all rows of tacks to be covered with strips, well and strongly cemented together.

On completion, paint the whole of the sheeting with one coat of special compound or "P. & B. paint."

If well executed, the above structure will prove to be durable and well worth the cost, though not so permanent as those described in previous issues.

The following materials will be required:—

12 in. or 10 in. diameter logs for plates, posts, struts, &c.:—7/22, 6/17, 5/13, 2/12, 4/11, 5/4.

230 lb. wrought iron bolts, nuts, and plate washers.

1,060 ft. lineal 6 in. by 2 in. sawn hardwood decking.

3 rolls 3-ply malthoid or other bituminous material, with cement and nails for securing same, included in the price at 40s. per roll prime cost in Brisbane, each roll being 72 ft. long, with a covering capacity of 200 square feet.

3 gallons "P. & B." paint, at 8s. 6d. per gallon.

8 gallons of tar, 8 lb. of pitch; 3 brushes, with an assortment of nails.

In constructing the above dam, great care must be exercised in fixing the bituminous sheets well into the ground at the toe, and into the sides of each bank.

What may be termed "hillside dams" are useful in collecting and storing a limited quantity of water at a higher level than is possible with gully dams, where the ground is ridgy and undulating or rising in

gentle but long slopes; the hillside dam is exceedingly useful in impounding water from the higher levels, and allowing the surplus to flow away, to replenish similar structures at lower levels; naturally the catchment area of hillside dams is limited; therefore, the site should be carefully selected, and not only the contour of the ground be considered, but the nature of the soil into which the excavation is proposed to be made should be carefully noted, to ensure against disappointment by leakage. The storage is partly in excavation and partly in fill, and the material excavated is used as embankment to retain the water above the surface. As there are no gullies in this connection, the ends of the banks have to be returned to higher ground to retain the water in store; the slope and manner of construction departs from the usual type in many respects; the inner or water slope may be as much as 1½ to 1, while the outside slope may sometimes be steeper, approximately 1 to 1. These dams may be so placed as to water more than one paddock, if so desired, but if the paddocks are large, it is much better to place them as near the centre as possible, so that the stock will not have too far to travel to water. There must, however, be a sufficient catchment area to run enough water to fill the excavation during heavy rains; a large area with a gentle slope is much better than a smaller area with too quick a catchment, as the latter often brings down very much soil and rubbish during heavy rains. It is also very important that all farm buildings, such as stables, pigsties, cowsheds, sheepyards, &c., should be removed from the catchment as being in danger of contaminating the water.

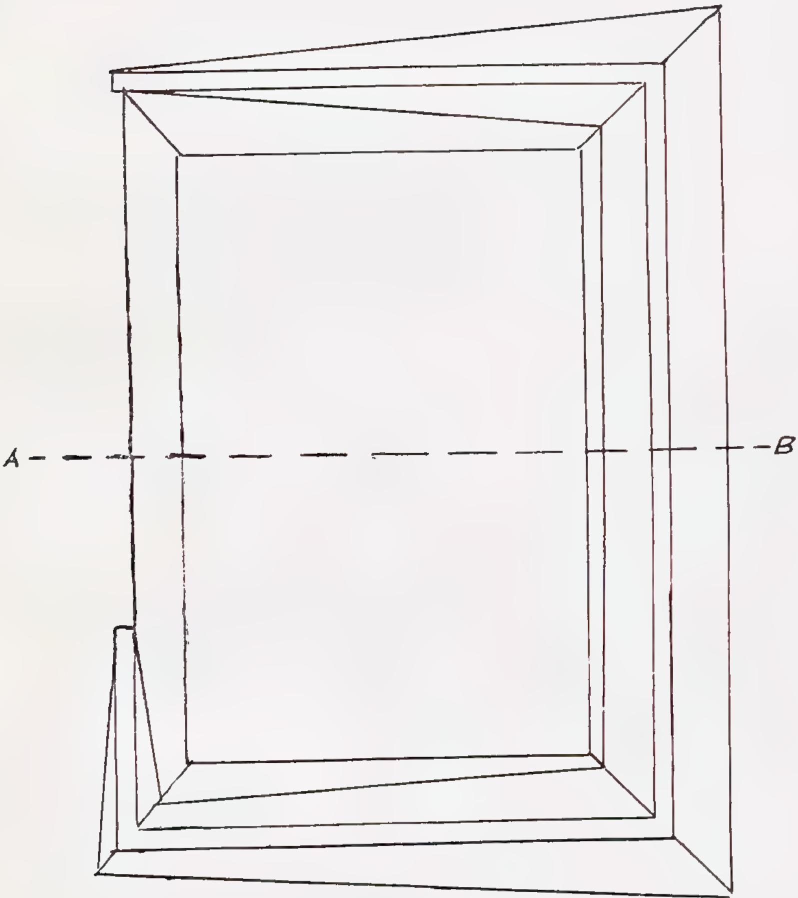
If the ground which it is proposed to excavate consists of good clay, much trouble will be saved in future, and it is certainly worth while putting down a few trial holes before deciding definitely on the site. A rock bottom, as a rule, does not hold as well as clay, and it is often the case that, when a reservoir of this character has been cleaned out to the rock, for some time afterwards the water escapes through the cracks and crevices, until another layer of clay is naturally deposited over the bottom. Clayey soils at the same time possess disadvantages which must be guarded against in building the embankments, as the slopes mentioned above would be unsafe in such soils, without special attention during construction.

Fig. 9 illustrates the plan and Fig. 10 the cross section of a hillside dam, from which it will be seen that the embankment is composed of layers excavated and placed at an angle of about 45 degrees to the horizontal; the seats of the banks should be ploughed; the surface soil removed, and placed at the outer toe of the bank; the material beneath this should be then excavated and placed in sloping layers as shown, well rammed in position; the last layers from the bottom of the excavation should then be placed so as to form a slanting puddle wall,

forming the water face of the embankment, extending right down into the excavation; the crest of the embankment need not be more than 3 to 4 ft. in width, but care must be taken at all times to prevent rat-holes being formed or allowed to exist, otherwise the embankment will be soon destroyed.

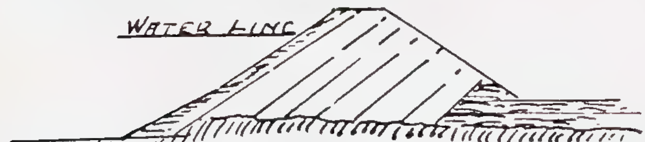
— HILL SIDE-DAM —

— FIG. 9 —



— PLAN —

SECTION ON A·B



— CROSS SECTION OF BANK —

It is advisable in the construction of these dams that a small silt tank should be made into which all drains should flow, and the overflow only allowed to go into the main excavation. This precaution will prevent much rubbish getting into the tank, and facilitate cleansing operations.

No bywash is necessary, as the surplus water flows away on the lower side, and the embankment can never be injured by an overflow. It should not be forgotten, in providing storage for water, that depth is the great point to be aimed at in preference to a large area, thus reducing evaporation as much as possible. The approaches for stock should also be pitched with stone or logged, to prevent damage. Couch grass planted on the heads of embankments binds together the loose material, and prevents it getting away. It is also a good plan to fence in the approach and to place a fence across the bottom to prevent stock getting too far. Whenever possible, it is an excellent arrangement to syphon out the water to drinking troughs at a lower level, fitted with ball taps or floating valves, which act automatically, and so prevent the main supply becoming fouled by animals.

The following rule for measuring tanks is taken from the "Farmer's Handbook," and may be found useful:—

RULES FOR MEASURING TANKS.

Add together the top area and the bottom area, together with four times the middle area. Divide result by 6, and multiply by the depth. If the measurements are in feet, divide by 27; and the result will then be the size of the excavation in cubic yards, thus:—

Top ..	..	60 × 80 = 4,800, top area.
Bottom	..	20 × 20 = 400, bottom area.
		40 × 50 × 4 = 8,000, middle area.
		13,200

13,200 ÷ 6 = 2,200.

2,200 × 10 (depth) = 22,000 cubic feet.

22,000 ÷ 27 = 814.81, content of tank in cubic yards.

[TO BE CONTINUED.

A CORRECTION.

GRAPES IN COLD STORAGE.

In the "Short Account of the Exhibits of the Department of Agriculture and Stock," issued in pamphlet form at the Exhibition, and subsequently published in this journal, an obvious printer's error occurred. It was stated that the grapes shown by the Senior Fruit Inspector had been kept in cold storage for "a week," whence they emerged with the "bloom on." This is a palpable absurdity. The ripe fruit had been kept in cold stores, as a matter of fact, for eight weeks. Such an error would, of course, not mislead a vigneron.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RECORD OF COWS FOR MONTH OF AUGUST, 1912.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Auntie ...	Ayrshire	4 July, 1912	1,170	4·0	52·29	
Lady May ...	,, ...	19 July ,,	679	6·4	51·05	
Lady Lock ...	,, ...	10 July ,,	1,132	4·0	50·95	
Rosebud ...	,, ...	24 June ,,	1,057	4·0	47·24	
Lady Margaret	,, ...	4 May ,,	716	4·6	37·04	
Reamy ..	,, ...	9 Aug. ,,	772	4·1	35·41	
Bluebell ...	Jersey	2 Aug. ,,	759	3·6	30·36	
Burton's Lady	Shorthorn... ..	1 June ,,	626	4·2	29·45	
Lerida ...	Ayrshire	4 Mar. ,,	790	3·2	27·89	
Rosalie ...	,, ...	15 Aug. ,,	630	3·9	27·41	
Dutch Fanny	Shorthorn... ...	24 Aug., 1911	465	5·0	26·24	
Burton's Lily	,, ...	7 Dec. ,,	318	6·2	25·26	
Lavinia's Pride	Ayrshire	23 Feb., 1912	589	3·8	24·93	
Lady Morton	Shorthorn... ...	9 Feb. ,,	509	4·2	23·94	
Miss Jean ...	Ayrshire	10 April ,,	440	4·6	22·77	
Laura ...	,, ...	6 Mar. ,,	525	3·6	21·0	
Miss Edition	Jersey	13 Aug. ,,	498	3·7	20·45	

ADVICE ON THE ROUTINE OF THE DAIRY.

By E. GRAHAM, Dairy Expert.

THE SEPARATOR.

The life of a Standard separator depends upon its care to a great extent. To allow a machine to become gummy or dirty must materially shorten its term of usefulness. Keep the separator free from dirt and the working parts well oiled; follow the directions as to the number of turns of the handle per minute. A uniform strain applied to the handle, and not a series of jerks, will contribute to both the skimming efficiency and the life of the separator. The continued use of light-grade oils, such as are first supplied with the machine, should be followed, as heavy oils are not suitable as lubricants for separators. A strong calico or oilcloth cover for the separator, to cover and protect it when

it is not in use, is quite worth while, as the coverings keep dust and dirt out of the bearings. It is essential that the separator must run smoothly. No machine will do good work if it is not running smoothly; under such circumstances, the layers of milk in the separator, instead of arranging themselves in correct order—the cream in the centre, and the skim milk at the outside of the bowl—are broken up and mixed by the vibration, and much of the fat is apt to ascape with the skim milk. When the bowl runs smoothly, the cream and skim milk are perfectly separated and find their respective outlets without interference. The importance of keeping a separator running smoothly may be further shown by the fact that tests of skim milk, taken from the same separator, have shown five times as great a loss under adverse conditions as when the machine has been running satisfactorily. The variations in the percentage of butter fat contained in the cream supply is often a source of concern to dairymen supplying butter factories. The farmer is likely to feel that when the milk is drawn from the same herd, fed and milked in the same manner, and the cream separated by the one separator and operator, the percentage of butter fat in the cream should not vary, and the average cream producer is likely to look upon a sudden variation in the percentage of butter fat in the cream as incorrect and indicative of careless or dishonest testing, and, while admitting that great care is needed to draw the samples and test cream correctly, variations are bound to occur that are naturally due to the conditions under which the milk is separated, as so many conditions are found to affect the efficiency of the skimming or the density of the cream.

The causes of variation in cream tests may be listed as follows:—

Smooth running,
Speed,
Cleansing of separator,
Volume of milk inflow,
Temperature of milk,
Condition of milk,
Richness of cream,
Richness of milk separated,
Amount of water or skim milk used to flush the bowl.
Position of cream screw.

The centrifugal force required to ensure the efficient working of a separator of any pattern depends upon the speed of the bowl. There is a certain speed at which every machine will do its best work. The manufacturer has ascertained the speed at which the separator works most satisfactorily, and shows the number of revolutions per minute on the crank of the handle, for the guidance of the farmer using the

machine. Usually a lower speed than that indicated causes loss of butter fat in the skim milk, but a higher speed is without beneficial results or may prove injurious to the machine. With no change in the adjustment of the cream screw which we assume in this discussion, excessive speed tends to increase the capacity for milk and causes the flow of a comparatively richer cream; but a reduction in speed will give a lower and proportionately larger *volume* of cream, which will be *lower* in its butter fat contents. While there is nothing gained by excessive speed, the greater the reduction in the number of turns below normal, the greater will be the loss in the butter fat carried away in the skim milk. The cleansing of the separator should be carefully attended to. It is a noteworthy fact that many users of separators are negligent in its care, and the idea seems to be that it is unnecessary to wash the separator more than once a day or once in two or three days. Nothing could be further from the truth. Even when the unwashed bowl is flushed with warm water, there remains a coating of slime and milk on the interior parts, which readily undergoes decomposition. When next used, the warm milk in passing through the unwashed bowl becomes contaminated with bacteria from this source, and is damaged materially in quality. Such cream may be dangerous to health, and it is certainly not fit for butter-making purposes. The repulsiveness of this unfortunately too prevalent practice should be enough to condemn it in the eyes of all intelligent dairymen. There is also an economic loss, caused by the use of an unclean bowl, which makes careful washing necessary each time it is used. With an unwashed separator bowl, butter fat losses in the skim milk are greatly increased. A series of trials with machines in otherwise good working condition shows that fully three times as much butter fat is lost from the unwashed as from the washed bowls. It is, therefore, obvious that regular washing as described for all dairy utensils is essential to best results with the centrifugal cream separator, both as far as the extraction of butter fat from the whole milk and the ever-important factor of quality of the cream are concerned.

Every separator has a rated capacity, and any attempt to force the milk through in greater amount or to reduce the inflow to any marked extent below normal may have serious results. It is important for each operator to note the rated capacity of his separator and regulate the inflow accordingly. Forcing milk through in excess of capacity tends towards the production of a thinner cream than that of a normal inflow; while a reduced inflow of milk, other things being equal, gives a thicker cream.

Warm milk separates more completely than cold, and the separator will do much more efficient work when the temperature of the milk is

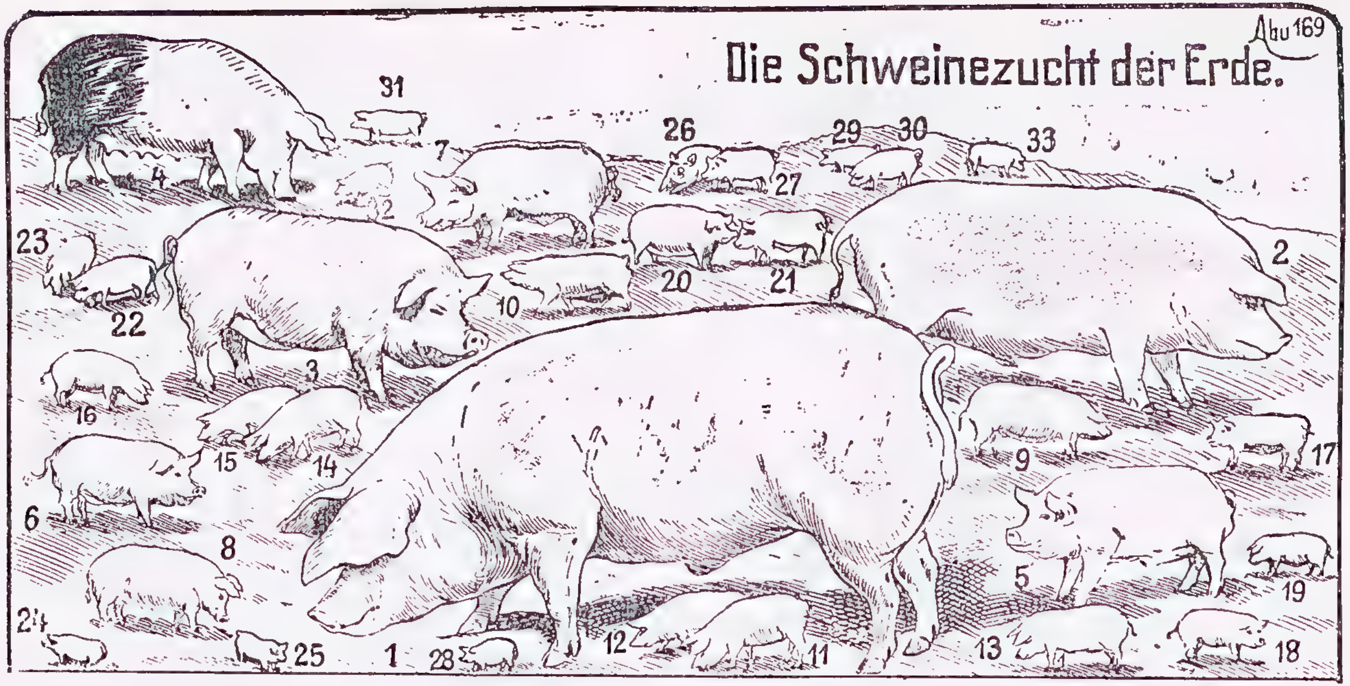
between 85 degrees and 90 degrees Fahr. than at any lower temperatures. Any claim that perfect separation of the milk can be effected when lower temperatures are employed is very doubtful. Variations in cream tests due to temperature of the milk, although of common occurrence, are perhaps not so marked as those due to the influence of the speed at which the bowl is driven. Not more than 3 or 4 per cent. variation of the cream test is due to the matter of temperatüre under ordinary circumstances. Using cold milk for the purpose of separation should be avoided, for the practice is generally associated with extravagant losses of butter fat in the skim milk. The colder the milk, the less the volume of cream extracted and the higher the test. Separating milk at 60 degrees or 90 degrees Fahr. will usually result in the loss of fat being at least one-half less in the instance where the higher temperature is adopted as compared with the loss when the lower temperature is used. Milk, as it comes from the cow, after thorough straining, is in the best condition for separation; it is then in a high state of fluidity and at the right temperature. Sour or curdled milk separates with difficulty or not at all. Slightly sour milk or milk that has "creamed" should be well stirred before entering the bowl, and it is better if slightly underfed into the separator.

[TO BE CONTINUED.]

SWINE-RAISING THROUGHOUT THE WORLD.

A short article on this subject, illustrated as below, is published in a Berlin journal, "Die Ernaehrung der Pflanze" (15th July, 1912), devoted to the agricultural interests of the world. It states that pig-breeding in Germany has greatly progressed during the last ten years, and that to-day that country produces far more swine than any European country (see illustration). The circumstance that America produces more than twice as many as Germany is accounted for, in the first place, by the fact that in that country, as with Germany, pig-breeding is a purely commercial industry, and, consequently, the pig is looked upon as a profitable and rapid means of increasing food supplies, and again because the natural conditions of the country for extensive stock-raising are more favourable. So soon as Austro-Hungary devotes itself with greater energy than at present to swine-breeding, it is to be expected that, in the near future, the two countries combined will overtake and surpass the numbers in the United States.

[The figures for Queensland are given as 125,000. We have taken the liberty of inserting the correct figures for June, 1912—viz., 173,902. —Ed. "Q.A.J."]



THE WORLD'S SWINE PRODUCTION.

1. United States ..	48,000,000	12. Argentine	1,500,000	23. Japan	300,000
2. Germany.. ..	22,150,000	13. Belgium	1,200,000	24. New Zealand ..	250,000
3. Austria-Hungary	13,600,000	14. Portugal	1,000,000	25. New South Wales ..	240,000
4. Russia in Europe	12,320,000	15. Sweden	1,000,000	26. Victoria	220,000
5. France	7,350,000	16. Servia	910,000	27. Turkey in Europe ..	210,000
6. Canada	3,000,000	17. Netherlands ..	865,000	28. Uruguay	181,000
7. Great Britain ..	3,700,000	18. Mexico	620,000	29. Chile..	178,000
8. Italy	2,500,000	19. Switzerland ..	550,000	30. Greece	175,000
9. Spain	2,400,000	20. Bulgaria	500,000	31. Luxemburg	138,000
10. Roumania ..	1,800,000	21. Cape Colony ..	400,000	32. Queensland	173,902
11. Denmark.. ..	1,500,000	22. Norway	320,000	33. Algiers	112,000

Poultry.

REPORT ON EGG LAYING COMPETITION, Q.A. COLLEGE, AUGUST, 1912.

Four thousand one hundred and eighty eggs were laid during the month—an average of 139·3 per pen. All the birds are now doing good work. R. Burns' Black Orpingtons again win the monthly prize with the splendid total of 172 eggs. The following are the individual records:—

Competitors.	Breed.	August.	Total.
R. Burns	Black Orpingtons ...	172	558
J. Gosley	White Leghorns ...	142	549
A. T. Coomber	Do.	151	524
T. Fanning	Do.	167	523
A. R. Wooley	Do.	144	512
Range Poultry Farm	Do. (No. 1)	158	507
E. A. Smith	Do. (No. 2)	153	496
H. Tappenden	Do.	147	485
E. A. Smith	Do. (No. 1)	134	455
J. R. Wilson	Do.	159	454
Yangarella Poultry Farm	Do.	158	446
R. Burns	S.L. Wyandottes ...	148	445
Mrs. Beiber	Brown Leghorns ...	144	444
W. D. Bradburne, N.S.W.	White Leghorns ...	131	443
Cowan Bros., N.S.W.	Do.	128	418
J. Zahl	Do. (No. 1)	145	397
B. Holtorf	Do.	129	386
Mrs. Sprengell	Do.	132	375
J. Holmes	Do.	128	348
H. Hammill, N.S.W.	Do. ...	140	340
Range Poultry Farm	Do. (No. 2)	134	334
J. Zahl	Do. (No. 2)	146	330
Mrs. Dredge	Do.	128	310
A. H. Padman, S.A.	Do.	86	309
J. F. Dalrymple, N.S.W.	Do.	101	301
W. W. Hay	Black Leghorns ...	138	296
D. Grant	White Leghorns ...	129	283
F. G. Cornish	Do.	135	252
R. Burns	Do.	139	244
Mrs. Craig	Do.	131	209
Total	...	4,180	11,973

The Orchard.

THE CONTROL OF PEACH CURL LEAF.

By CHAS. B. WEEKS, Horticultural Commissioner of Tehema County, Red Bluff, Cal.

A few years ago the writer was very much discouraged by losing two crops of Elberta peaches from the fungus disease, curl leaf (*Exoascus deformans*). The first crop was lost by the complete defoliation of the trees in April by the curl leaf, and the consequent dropping of the fruit. The trees being unprotected sunburned very badly and failed to develop any fruit buds during the summer, and the following spring found the orchard without any blossoms and the trees in very poor condition. This was the experience of many growers in this county, and for a while the advisability of making new plantings of Elbertas was questioned.

VARIETIES ATTACKED.

The varieties most susceptible to attack are Elberta, Early Crawford, Late Crawford, Susquehanna, Hale's Early, Seedlings, Lovell, and Muir, in the order named.

The Muir is the nearest to being immune of any variety, standing throughout a season without a sign of the disease when the other varieties named suffered severely, but this is an exception and not a rule, and the Muir should never be neglected on the supposition that because it will not curl some seasons it is not necessary to spray.

APPEARANCE OF CURL LEAF.

Almost every grower is familiar with the appearance of curl leaf, and I will give but a short description of it. As soon as the leaves have attained a length of half an inch or so, it will be noticed that the diseased ones have a lighter colour than the healthy leaves, and have begun to bend either backward or to one side. In a short time they take on very grotesque forms, not to say disgusting. In three weeks or a month the leaves that are completely curled will begun to drop, while those that are curled on one edge will only stand for a week longer. In the case of trees that are badly attacked all the leaves will drop. Where the attack is lighter the bottom leaves drop, the disease appearing to work up the tree, or rather making its appearance on the lower limbs first.

TIME OF CONTROL.

Practically absolute control can be obtained by spraying with Bordeaux mixture. There are two seasons of the year when curl leaf can be successfully controlled: in the fall between the fifteenth of November and the fifteenth of December, and in the spring before the leaves begin to show green.

METHOD OF CONTROL.

If the curl is to be combated in the fall, a much stronger solution of Bordeaux must be used than if the spraying is to be done in the spring;

7 lb. bluestone and 7 lb. lime to 50 gallons of water being the strength used for this spray, or the same used for spraying peach blight, while 4—4—50 is strong enough for the spring spraying.

If the spraying is done in the fall and the season is very favourable to the growth of the curl leaf fungus, the control will not be quite so complete as if the spraying had been done in the spring. The experience of the growers of this county indicates that the fall spraying is to be desired for the reason that the orchards are dry enough at this season of the year to carry a spray outfit without cutting the ground up, and absolute control of peach blight can be obtained at the same time.

Should it happen that both fall and spring spraying have been neglected and the new leaves show that the curl is making its appearance, much damage can be prevented by spraying with Bordeaux 2—2—50. This, however, cannot be recommended except as a last resort when circumstances have prevented the former application. Do not think from this statement that this spraying is of doubtful benefit, as in some seasons it means the difference between a full crop and none at all if it is done before the leaves have become half grown. If sprayed later than this, the benefit is very much less. Peach leaves at this time are very susceptible to Bordeaux injury, and care must be taken to have not more than 2 lb. of bluestone and at least 2 lb. of lime to 50 gallons of water.

From the writer's experience, the commercial lime-sulphur has a marked fungicidal value when used as a spray for the peach worm just as the blossom buds are beginning to open, using it at a strength of 1 to 11 water.

If the fall spraying for blight and curl leaf is practised and the trees sprayed with lime-sulphur in the spring, it will be found that the trees are in better condition than could be obtained from following any other course.

It has been observed that trees sprayed by the rule above mentioned for several years in succession, except this season, show less curl leaf than unsprayed trees—in fact, so little as to cause no commercial loss. While this has proved the case this year, it cannot be stated as a fact that spraying every other year will control the curl leaf.

SUMMARY.

For commercial peach orchards spray just as the blossom buds begin to open, with lime-sulphur 1 to 11—in fact, any orchard that the owner depends on for a living will show big returns from spraying with Bordeaux between the 15th of November and the 15th of December, using the 7—7—50 strength.

If for any reason the fall spraying has been omitted and the owner wishes to spray for the peach worm and the curl leaf at the same time, the lime-sulphur and Bordeaux (4—4—50) may be combined. If no spraying has been done until after the leaves have started and show green, spray with Bordeaux 2—2—50. Never depend on a dry season being free from curl leaf.—"Monthly Bulletin of the State Commission of Horticulture, California."

GIANT LOQUAT.

Mr. J. A. Beal, who devotes much time and care to the cultivation of fruits, flowers, and vegetables at Corinda, has been very successful in his experiments in growing loquats. Some three or four years ago he obtained seed from some fine loquats bought from a fruiterer. The trees raised from these seeds are now bearing for the first time, and the fruit is certainly the finest we have ever seen. The soil on which they were raised is a chocolate loam with a little clay subsoil. At the outset they received a little liquid manure, but no manure has since been applied. The dry weather of the past month had no injurious effect on the trees, which carry from twenty to thirty fine bunches per tree. The illustration shows the natural size of the fruit.

PLATE 35.—GIANT LOQUAT, GROWN BY MR. J. A. BEAL, AT CORINDA.

Tropical Industries.

THE CULTURE OF CARAVONICA TREE-COTTON.

Notwithstanding the fact that Caravonica cotton has been grown for some time in North Queensland, little or nothing is heard about the results through the Press. Early in September we received a parcel of this valuable class of cotton from the Government Resident at Thursday Island, where it had been grown at the State school. This sample was, unfortunately, a mixture of the three varieties of Caravonica, and had not been properly graded or cleaned. Had it been nicely got up, with all damaged cotton removed, and the varieties separated, it would probably be worth 1s. per lb. in the English market, whereas in its present condition it would bring 8d. only.

Mr. David Thomatis, the originator of this class of cotton, has written the following interesting article on its cultivation, treatment, market value, &c., for "Cope's Leaflets" (London), which are regularly published in the interests of tropical agriculturists:—

THE CULTURE OF THE CARAVONICA TREE-COTTON.

By its Originator (Prof. David Thomatis).

Preliminary.

Many people have written on Caravonica, given their opinion, proposed their theories, and suggested their methods of culture; some announcing successful results, others lamenting complete failures. My opinion is that very few as yet know exactly how to treat and cultivate Caravonica; and for the sake of successfully establishing on proper methods and on safe permanent bases the culture of this variety of cotton, which, I am fully persuaded, is destined to eclipse and supersede all other existing varieties and place the cotton industry on regular lines, the culture should be properly understood, and the various Governments and all the serious investors and planters should co-operate in the success of this culture. The Federal Government of Mexico, although at present harassed by internal disturbances, has given the first example in appreciating the importance of the culture of Caravonica, and commissioned its originator (the writer) to visit the country and make all the necessary studies and investigations. From what I have already seen, Mexico is destined to be the supplier of Caravonica to the whole of Europe. I am putting this little word in the ear of those investors who look for sound properties.

Everybody knows how I have created this new variety by crossing two indigenous tree-cottons, one from Mexico, the other from Perú, obtaining the *Wool* kind; then by crossing this with a species of Sea-Island, I produced the *Silk* kind. The motives that impelled me to

attempt evolving a new variety for Tropical Australia (where I was then residing) were the scarcity and dearness of labour, coupled with the six months of drought and six months of heavy rain—two circumstances which are totally unsuitable for herbaceous cottons.

SEED.

Great care should be taken in selecting the particular bolls to get the seed from. The shell of the bolls should be spotless, and possess not less than four lobes and sometimes five; the bolls should be allowed to ripen fully on the tree until the fibre comes out and hangs down loose, also the seeds should be taken out by the hand and not treated by the gin. Of course, all this refers to the first lot of seed in beginning a plantation, so as to have an original field of a few acres. After this, the general mass of seed may be used for propagation. There are about 2,000 grains of the *Wool* seed to the pound, and about 2,500 of *Silk*. For every region, a planter should grow an acre or so, which he can do at the very first, while he is going on clearing the land, and by the time the planting area is cleared the trees of the 1 acre will have the crop ripe, and the seed therefrom can be used to plant the whole area. In this way the seed will be a little acclimatised to the region.

CLIMATE.

Caravonica cotton is a tropical plant, but it may exist a little outside in sheltered localities where the frost is unknown. As a rule, where bananas can live without being frost-bitten, Caravonica can live also. There should also be a season *of at least four months without rain* (short, light, occasional showers would not matter). During these months the crop should ripen and be gathered, and the tree may and should be trained to bear in these months.

SOIL.

Sandy ground is the ideal ground for Caravonica; it need not be rich, and, if originally constituted by the disintegration of granite rocks, or even sandstone, would be an excellent ground. If, moreover, the subsoil is of a gravelly or even pure sandy stratum, it would be a great advantage, as, generally, beneath this there is moisture or even water.

Heavy argillaceous soil is unsuitable, because during the rains there will be stagnant water, which will sicken and kill the cotton trees, and during the dry season the clay will cake and harden and squeeze the rootlets. Marshy or swampy ground would be decidedly deadly to the Caravonica tree. A passing inundation of the ground during heavy rainfalls for one or two days would be of no injury. As seabreeze is good for the health of the trees, a locality near the coast is preferable, but not essential, as Caravonica thrives also in the interior in sheltered valleys at any reasonable altitude. A generally level ground is preferable, but there is no objection to undulating ground with gentle slopes or hillocks. The main thing is the nature of the soil—to be sandy, light, loose. All plantations of tea, coffee, sugar, or maize will do.

Planting.

The seed is planted direct on the spot, out in the field; no nursery is required, as transplanting is not only unnecessary, but risky and undesirable. If the field is fresh virgin ground cleared from scrubby land, it cannot, of course, be ploughed, so it should be first sown with maize, and a week after the cotton seed put in, by making, every 10 or even 12 ft., a hole—say 1 ft. every way (cubic)—then filling it with surface soil, including little sticks, ashes, &c., so as to leave a little elevation of a few inches over the general level of the ground, and on the top put the seed, 1 inch deep; practically, 3 grains should be inserted in a triangular form, about 3 in. from each corner, in case one or two seeds miss germination. When the plantlets are 1 ft. high, the two weaker ones could be pulled up. These holes should be in a straight line and same distance both ways. The planting should be done before the proper rainy season, as soon as little showers commence, so that when the heavy rains start the cotton plants will be over 1 ft. high. The seed will germinate in five to eight days if the soil is damp enough. It is not advisable to steep the seed in water before planting; or, if it is done, it should be for an hour only. If, during heavy showers, any water should lodge stagnant, a trench or hole should be dug close by, so as to draw the excessive water into it from near the cotton plantlets.

If the field is old ground and can be ploughed, it should be ploughed (but, of course, not necessarily); then maize planted; then, instead of making the holes, only little mounds formed with the hoe at the same distance as above stated, and the seed placed thereon, or even putting the seed on the crest of a furrow, without any mound.

Culture.

It is very simple and inexpensive—in fact, the value of the catch-crops of maize grown between, first at the time of planting the cotton seed, and grown afterwards within eighteen months, is sufficient to repay almost all the expenses of clearing the scrub of virgin land or of ploughing. This has been my practical personal experience and result. These maize crops not only are profitable, but they also are highly beneficial to to the growth of the young cotton plants. The maize will keep the soil fresh and sheltered from the hot sun; will be a strong protection against winds, which would be very injurious to the cotton plantlets; its stalks will serve as mulch around the cotton trees; will prevent the growth of grass and weeds; finally, the maize will serve a great novel purpose, which I have discovered by careful investigation. It will prevent the existence of pests, and, above all, the dreadful boll-weevil! These pests and the boll-weevil, if they spring up at all, will feed on the top shoots of the young maize entirely, taking no heed of the young cotton, and, when this has grown up a big tree and no more maize can be sown between, the pests and the weevil *will die of starvation* for want of the young maize to which they have been accustomed, because they will not relish or accept any other food, not even the cotton plants and their bolls!

The underpart of the cotton plant consists of a straight tap root, which goes down to get moisture, and of little hair-like rootlets, which spread out and run only a few inches below the surface and through which the plant gets its food. The plant will produce blossoms when about five months old, but they should be plucked off and the second blossoming awaited, to allow the plant to get more vigorous. The Caravonica tree can be trained to bear its crop at the time of the year that is most suitable as to the rains. To obtain this, do not allow any blossom to remain on the tree before one month of the rainless season. By doing this operation the first year, the following year very few blossoms will appear at the wrong time, and, if some, these should be plucked off; the following year again no blossoms will appear too soon, as the tree will be trained completely. This variety is really to be admired, and I know of no other plant so obedient! When the tree is about 10 ft. high, the crowns should be topped; then the tree will spread out in numerous lateral branches, and the whole ground will be completely covered, thus necessitating very little weeding.

The very lowest branches near the ground should be repeatedly cut off, as they only serve as a nest to pests. Every two years the trees may be pruned before the rains, thus inducing many secondary lateral branches, young and vigorous, every year. These new branches bear the crop the same year. After ten or twelve years, when the trees may show signs of old age, the trees may be entirely cut down to, say, 6 in. from the ground immediately before the rainy season, and the field ploughed and sown with maize. The old stumps will shoot up and turn into young trees in time to give a crop the same year, so by cutting down the trees not a single crop is lost.

If any manuring should be required, the best would be kainit and ashes, using the weed as mulch.

CROPPING.

The quantity of crop depends on the size and development of the trees. I had trees which, without any special attention at all, yielded, when eighteen months old, up to 25 lb. of bolls, of which over 52 per cent. was clean lint, and very many yielded 12 lb. of seed-cotton. On the tree there are constantly for over four months flowers and young and ripe bolls. About 60 bolls of the *Wool* kind and 70 bolls of the *Silk* kind weigh 1 lb., and the net lint should not be less than 50 per cent. if the cultivation is well conducted. I had trees whose bolls yielded up to 65 per cent. of clean lint, whereas the average of all other varieties is 28 per cent., and there is no instance of over 35 per cent. At 10 ft. apart there are 400 trees to the acre. On a well-managed plantation, after the first year the average yield of a tree should not be less than 5 lb. of bolls —that is, 2½ lb. clean lint, worth in the market over 12d. per lb.; but it is easy to get double this quantity, and it is reasonable to expect it. The picking is easy, because the bolls are large and conspicuous; it should not be done before 9 a.m., nor during showery days. The bolls picked should be exposed to the sun on hessians for several hours before being housed for the gin. Dampness is very injurious to the fibre and also to the seed.

The *Wool-tree* grows up more regularly on a distinct trunk, while the *Silk-tree* grows more as a bush with many branches from the start. The *Wool* bolls are larger and easier to pluck off than those of the *Silk* kind. It is a matter of taste and of business to grow one or the other kind. You must be guided by buyers' requirements. The *Wool* is used for mixing with animal wool—its fibre is thick and long—over 60 millimetres, or nearly 2½ in. The *Silk* has a whiter lint, the fibre thinner but strong, and shining like silk; it is used for weaving material to imitate real animal silk.

Conclusion.

There is no doubt that Caravonica Cotton is soon to monopolise the cotton market. All that is required is to grow it in large quantities to take the place of the other ordinary cottons. Carovonica is easier and cheaper to grow—it is at present the best, the most valuable, and the most useful quality known; it is easier to spin and to weave; it can take the place of the sheep's wool, as well as of the bombyx silk. The Caravonica tree is very resistent to diseases, pests, and the dreadful boll-weevil if properly treated and handled. On my plantation in Australia I never saw a sign of any disease, pest, or boll-weevil for over eight years, whereas these diseases and the boll-weevil were abundant among the American cottons grown in Australia. Of course, I do not pretend to state that Caravonica trees cannot be affected or attacked by diseases; I am informed that they have been in various localities, but there must be particular causes. Even here in Mexico and the neighbouring Guatemala —in fact, not 200 miles from here—Caravonica trees have been affected by diseases; the culture resulting in a failure But I am not deterred by these facts. In my experimental station here, nearly half way between Salina Cruz and Guatemala, and not very far from the rubber plantation La Zacualpa, my Caravonica trees are healthy. I say, again, Caravonica cotton is easily grown; but it requires its proper care, as does every *pet docile child.*

"BULLETIN OF THE IMPERIAL INSTITUTE."

This "Bulletin" was first published in 1903. It appears quarterly, and contains:—Reports on investigations conducted in the Scientific and Technical Department of the Imperial Institute; articles and notes dealing with mineral and vegetable economic products; and a quarterly summary of information on recent progress in agriculture and the development of natural resources.

Until this year the "Bulletin" has been published by the Imperial Institute, but, owing to the increased demand for it, its publication has now been undertaken by Mr. John Murray, 50a Albemarle street, London W., and the first number of the new series has appeared.

The principal contents of this first number are as follows:—Rubber Resources of Uganda; Some Cotton Soils of the Nyassaland and Uganda Protectorates; Kola Nuts from British West Africa; Coca Leaves from Ceylon and the Federated Malay States; Aromatic Grass Oils, Part III.; Hibiscus Fibres from the Northern Territories, Gold Coast; Timbers

from Uganda; Sumach from Cyprus; Economic Products from Mauritius; The Coconut and its Commercial Uses, Part I.; Cultivation, Preparation, and Utilisation of Hemp and Hemp Seed (*Cannabis sativa*); Cultivation and Preparation of Ginger; Agricultural Work in Seychelles; Candelilla Wax; Sisal Hemp in Quilimane; New Zealand Hemp; Iron Ore from Trinidad; Copper-Mercury Ore from Queensland; Native Labour Regulations in Mozanbique.

The second number, now in the press, will have the following principal contents:—Tobacco Industry of Ceylon; Some New Gutta Percha-yielding Plants from the Gold Coast; *Ficus elastica* Rubber from Southern Nigeria; "Balata" Rubber (*Ficus Vogelii*) from Southern Nigeria; The Rubber of *Cryptostegia grandiflora;* Silk from India; Cotton and Sisal Hemp from Papua (British New Guinea); Fibres from India; Utilisation of *Caesalpinia digyna;* Oil-seeds of *Telfaria pedata; Lophira* Oil-seeds from West Africa; Oils and Oil-seeds from Hong Kong; West African Cocoa; The Cultivation of Cigar Tobacco with special reference to Java; The Coconut and its Commercial Uses, Part II.; Shea Nuts and Shea Butter; Rubber-tapping Experiments in Southern Nigeria; Economic Developments in the Belgian Congo; West Indian Satinwood; Oil of "Nepal Camphor Wood"; Citronella Grass; *Mesembrianthemum Mahoni* Roots from the Transvaal; Rubber Exhibition in Java; Cultivation of Fibres in Java; "Root-cotton"; Perilla Seed and Oil.

The annual subscription to the "Bulletin" is 10s. 6d., or 11s. post free; single numbers may be purchased at 2s. 6d. each, or 2s. 9d. post free. Subscriptions may be paid through any bookseller, or, if no bookseller is available, they may be sent direct to Mr. John Murray, 50a, Albemarle street, London W.

[We should be pleased to see some mention of the products of Queensland, many of which have been sent to the Imperial Institute.—Ed. "Q.A.J."]

A QUEENSLANDER IN NEW CALEDONIA.

"Le Bulletin du Commerce," published at Noumea (N.C.), states that Mr. Hern, of that city, lately paid a visit to Queensland with a view to gaining information on agricultural products of our State which might be advantageously introduced into New Caledonia, since both countries are situated in the same latitude, and consequently it is considered probable that the soil and climate of New Caledonia might easily adapt themselves to the cultivation of the most remunerative crops produced in Queensland. Mr. Hern here met Mr. Daniel Jones, late of the Department of Agriculture and Stock, and was able so to interest him in New Caledonia and its agriculture that Mr. Jones decided to accept Mr. Hern's invitation to make an extended tour in the interior, in order to study the nature of the land with a view to recommending the most suitable crops. Already Mr. Jones has reported favourably on the agricultural prospects so far as he had already seen. Mr. Hern and Mr. Jones are now making an extended tour through the principal agricultural centres of the interior, and it is anticipated that the results of the visit will prove highly advantageous to the country.

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

By F. MANSON BAILEY, C.M.G., F.L.S., Colonial Botanist.

Order FILICES.

LINDSŒA Dryand.

L. flabellulata, *Dryand,* var. **multipinnulata,** *Bail. n. var.* (Plate 36). Plant of a rather dense growth. Rhizome rather slender, clothed with bright, glossy scales, hairy and golden colour. Stipes of a bright-brown or mahogany colour. Branches numerous, the lowest and sometimes many of the others opposite. Sterile pinnules prominently serrate. Indusium broad, continuous.

Hab.: Cardwell, *K. Broadbent;* Thursday Island, *Hon. John Douglas,* 1893; Hinchinbrook Island, *H. Tryon,* 1912.

The nearest ally of the present plant seems *L. media,* R. Br., usually placed under this species.

Order FUNGI.

The following additions to our Fungi have been determined by Miss E. M. Wakefield, Royal Botanic Gardens, Kew, England:—

HYMENOMYCETEÆ.

Agaricus (Flammula) spumosus, *Fries.*

Hab.: In grass land, Enoggera, *C. T. White.*

Agaricus (Panæolus) papilionaceous, *Bull.*

Hab.: On dung, Brisbane River, *C. T. White.*

Agaricus (Panæolus) fimiputris, *Bull.*

Hab.: On dung, Brisbane River, *C. T. White.*

Hygrophorus virgineus, *Wulf.*

Hab.: In grass land, Brisbane River, *C. T. White.*

Marasmius epileucus, *Berk.*

Hab.: On rotten wood in a scrub, Enoggera, *C. T. White.*

PYRENOMYCETEÆ.

Myiocopron orchidearum, *(Mont.) Sacc.*

Hab.: Very common on dead leaves, sheaths, &c., of *Cymbidium albuciflorum* in our Southern scrubs, *C. T. White.*

Pemphidium dilatatum, *Berk. et. Br.*

Hab.: On dead petioles of Cabbage-tree Palm (*Livistona australis*), near Mooloolah Heads, *C. T. White.*

SPHÆROPSIDEÆ.

Phyllosticta sterculiae, *Wint.*

Hab.: On leaves of Flame Tree (*Sterculia acerifolia*), Sandgate, *C. T. White.*

HYPHOMYCETEÆ.

Fusarium elongatum, *Cooke.*

Hab.: On branches of *Cherimoya (Anona),* Brisbane, *C. T. White.*

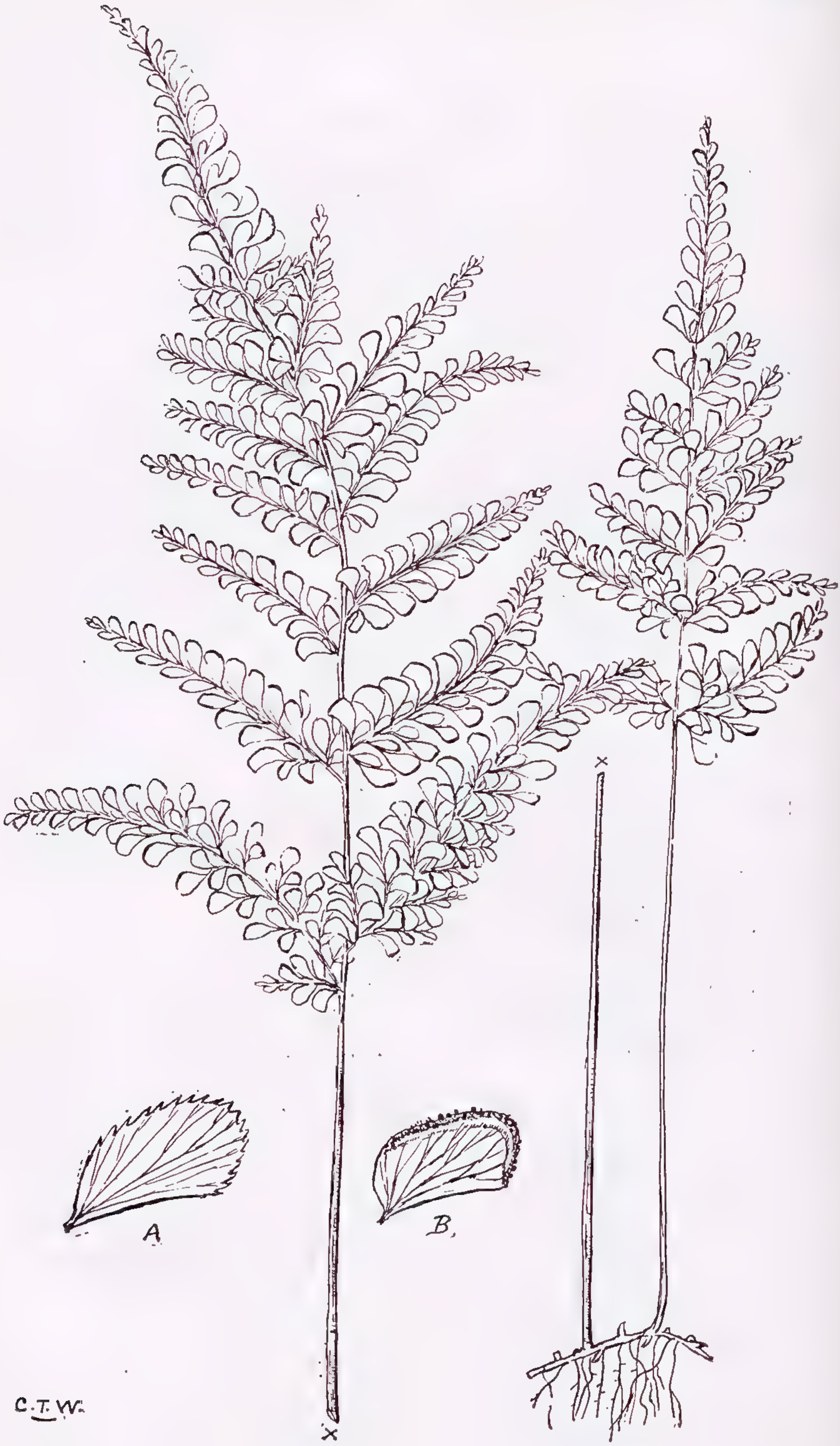


PLATE 36.—LINDSÆA FLABELLULATA, *Dryand. var.* multipinnulata, *Bail. n. var.*

Animal Pathology.

(Reprinted from Proc. Roy. Soc., Victoria, 25 (N.S.), Pt. I., 1912.)

THE INTRODUCTION AND SPREAD OF THE CATTLE TICK (BOOPHILUS ANNULATUS, var. MICROPLUS), AND OF THE ASSOCIATED DISEASE TICK FEVER (BABESIASIS) IN AUSTRALIA.

By J. A. GILRUTH, D.V.Sc., M.R.C.V.S., F.R.S.E.

[Read 14th March, 1912.]

Australia, although a large portion of its local area is situated within the tropical belt, is happily free from almost all those protozoan diseases which affect the domesticated animals in tropical regions elsewhere. For this she has to thank not quite so much the foresight of her administrators as her insular position, the fact that no domesticated animal is indigenous, and above all, the fact that all her importations have been derived almost solely from the original home of her people—namely, Great Britain.

Nevertheless, there are at least two specific diseases present in Australia, both affecting cattle, and both the cause of considerable pecuniary loss to stockowners, either directly or indirectly, and these are diseases which are unknown amongst British stock. The diseases in question are "Tick Fever" or "Redwater" (*Babesiasis*) and the so-called "Worm Nodules," due to the parasite *Onchocerca gibsoni,* which is dealt with in another paper.

Tick fever is not found all over Australia. It is rare in the Southern States, and has not yet appeared far south of the tropical border. The evidence all points to its greater prevalence the further north stock are pastured.

Now, as the Australian tick fever is not present amongst the British herds which have formed the basis of our Australian herds, it is highly incumbent on us to ascertain exactly how it came to be introduced, or at least the most probable sources of introduction. But to do so one must first of all consider which countries are most likely to have been in a position to affect Australia in such a manner.

So far as I can gather, there are no official records of stock importations ever having been made through any ports other than the main ports of the southern part of the continent and Queensland. At these ports there has been almost from the earliest days of settlement a more or less satisfactory system of inspection and quarantine, and the most cursory official examination could have hardly failed to detect the tick parasite, which is a necessary agent in the natural transmission of tick fever. Had its presence been overlooked in any instance, one is safe in concluding that it would have been heard of primarily in one of the southern districts. But we hear of its appearance first in the Northern parts of the tropical regions, far away from known ports of cattle entry.

One is therefore impelled to the conclusion that the disease must have entered by way of the Northern littoral, unless indeed it be assumed that the same tick parasite affects indigenously the native fauna, for which assumption there is absolutely no evidence. Irresistibly, we are compelled to look to the countries lying north of Australia as the possible source of original infection.

The nearest territory whereon cattle are husbanded is the Dutch Indies. There we know that the tick is a common parasite among the native cattle, and that, although these cattle exhibit a great natural immunity to the blood-parasite (*Babesia*), the true cause of tick fever, which is transmitted by the tick, yet imported non-immune cattle are very susceptible, at least in the Straits Settlements adjacent, and, unless special precautions are adopted, are almost certain to succumb in considerable numbers. The same conditions obtain in other tropical countries lying further north.

Our nearest neighbour has, therefore, this tropical disease of cattle. But we are separated from her by hundreds of miles of sea, communication is infrequent, and, besides, there are no official records of the importation of cattle therefrom to Australia. If it can be shown that live cattle have been imported notwithstanding, the position becomes clear. If not, it seems obvious that other agencies must be looked for, and that, if this disease has been introduced by unknown means, other and perhaps more to be dreaded tropical animal maladies may be introduced in the future; indeed, they may be at the present moment existing to some extent in our Northern areas.

The buffalo naturally offered a possible solution. It is well known that the Governors of the British settlements at Melville Island and Port Essington (about 1826 and 1828) imported the mud or swamp-buffalo from Timor; and Johnston and Cleland have drawn attention to the fact that the Governor of the Port Essington Settlement was also empowered to import cattle from the Netherlands Indies, though they could find no record of this having been done.

Since their introduction to Port Dundas by Sir Gordon Bremmer, in 1824, the buffalo have spread all over Melville Island; and since their introduction to the mainland at Port Essington they have gradually spread southward along the swampy plains near the sea-coast to within a few miles of Port Darwin. A few have wandered inland, chiefly bulls which have left the main herds, one or two being occasionally seen as far as the Roper and even the McArthur Rivers.

During my visit, thanks to the kindness of Mr. W. Lawrie, I had an opportunity of examining a number of fresh buffalo hides, besides a buffalo killed for my examination, and no ticks were detected thereon, although these animals were running on land where the cattle were badly tick-infested. Again, in Melville Island, I was enabled, through the courtesy of Messrs. Robinson and Cooper, to examine buffalo immediately after slaughter and buffalo hides, and can testify to the freedom of these animals, at least at the time of my visit, from cattle ticks or other tick infection. This, it must be admitted, is in accordance with the experience of buffalo hunters generally.

Others, it is true, have assured me that they have actually seen the tick on the buffalo, and, while not being in a position definitely to contradict these statements, I am inclined to the opinion that the large louse (*Haematopinus* sp.) which constantly affects these buffalo, may, in a cursory examination, have been mistaken for ticks—that they have been so confounded by some, I am certain.

It should be here observed that about 1886 Indian buffalo (two cows and one bull) were brought to Port Darwin by the agency of the Government, with the intention of establishing the Ghi (or buffalo butter) industry. Some of the descendants of these buffalo may still be seen being employed as beasts of burden. They also are apparently tick-free, and in any case were introduced subsequent to the known appearance of redwater or tick fever in the north.

I think, therefore, the buffalo may be held guiltless of the charge of introducing the cattle disease in question, the chief reason being that to-day he is unaffected with the necessary skin parasite, even when grazing on the same land as badly-infected cattle.

The result of my inquiries, however, abolishes any necessity for assuming any other agent in the introduction than the live bovine animal itself. Through the kindness of Mr. J. Campbell, late Secretary of Agriculture, Sydney, I have been able to procure a copy of a despatch, being a report on the Port Essington Settlement, addressed to the British Government by Captain Everard Home, dated from H.M.S. "North Star," 19th April, 1843. Captain Home furnishes a description of the settlement at that date, and states, *inter alia*, "of stock they have 1 English cow and a bull, 2 Indian heifers and 2 cows, about 50 goats, and a few fowls. . . . . There are besides 6 working oxen and 30 buffaloes and pigs, the property of the Government." That the descendants of these Indian cattle are still on the Coburg Peninsula is vouched for by Mr. E. O. Robinson, Mr. H. W. H. Stevens, Mr. R. J. Cooper, Mr. C. Freer, and others, who have traversed the country buffalo shooting, &c. The evidence is, however, that these cattle, unlike the buffalo, have not spread, and have never reached country occupied by station cattle. But that they would originally bring with them cattle ticks is almost undoubted.

Unfortunately, at the time of my visit to Darwin there was no means enabling me to reach Port Essington, so that an examination of the descendants of the original cattle, interesting and important as such an examination would have been, was impossible.

But that this importation alone would not account for the spread of ticks through tropical Australia I am convinced, for the reason that the natural spread of ticks is by cattle, and rarely by other agencies. We may look to another and later importation of Brahma cattle as in all probability the true source of our trouble. Mr. H. W. H. Stevens, who was at that time connected with the British Australian Cable Company, informs me that in August, 1872, the settlement at Darwin, then Palmerston, being short of meat, the company's vessel, the "Investigator," landed from Batavia 12 native cattle (8 cows and 4 bulls), and that some

of the Resident dated 1st January, 1886, which contains the statement that "of 3,000 Wave Hill cattle passed to the westward, hundreds died of redwater." In the report of 1st July, 1886, these losses are again referred to, and also in some notes by Mr. A. Giles, then resident at Springvale, near the Katharine Station, who states that ticks on cattle and horses appeared here for the first time in any number this season, arguing a recent invasion of the district. In the report of 1st January, 1887, redwater is definitely referred to as a "serious disease." That its prevalence had previously been well known to settlers is indicated by a statement in the first report of a stock inspector, who stated that redwater "continues to be the *bête noir* of drovers from Queensland *viâ* the Roper River." Henceforth the disease assumes an increasing importance in these official reports for several years. In that of January, 1899, considerable space is devoted to its ravages, and Mr. H. W. H. Stevens affords some valuable information: "The first cattle that I know of to show redwater were Mr. C. B. Fisher's mobs that came along the Roper during the dry weather. . . . Out of 1,700 we took delivery of in August, 1882, fully 400 died on arrival on the Glencoe run." He then fixes the locality where the trouble begins as "from the junction of the Hodgson River with the Roper River, along the Roper west and north-west as far as its head, and in the neighbourhood of the King and Katharine Rivers for a few miles." He mentions three mobs from different parts—Gregory Downs, Queensland; Limmen Bight, Northern Territory; and Newcastle Waters, Northern Territory—which suffered a loss of from 20 to 30 per cent. from passing through the infected country. Yet Mr. A. Giles, then at Springvale, on the Katharine, states the disease in cattle is unknown there—a position quite easily understood in the light of present-day knowledge

In the next official report, 1890, the significant statement occurs: "It is generally stated that redwater (so-called) does not attack acclimatised or Territory-bred cattle." The chief complaint throughout is that overlanded cattle, travelling from Queensland especially, alone exhibit the symptoms of the disease, and die therefrom. To-day, when the full nature of the disease is understood, these circumstances are not at all surprising. By 1891 the report shows that cattle coming from Queensland generally become affected between the McArthur and Roper Rivers, which proves that the disease was gradually spreading backwards towards the Queensland border along the stock routes.

It must be remembered that at this time, and, indeed, prior to the publication by Smith and Kilborne in 1893 of the records of their exhaustive experiments, the relationship between redwater and ticks was not appreciated. It will be understood, therefore, that the spread of the visible parasite, the tick, was not associated in the public mind with the

specific and deadly disease redwater. Ticks always appear in a new district for some time before there is any definite occurrence of the disease redwater, and indeed their multiplication may be so gradual that beyond " tick worry," especially where the land is sparsely stocked, as in the Northern Territory, the majority may become gradually immune to the specific blood parasite, the actual cause of redwater, conveyed by the tick.

That ticks and consequently the disease redwater or tick fever originally reached Queensland from the Northern Territory, the reports of the officers of the Queensland Department of Agriculture leave no doubt. About 1894 Mr. C. J. Pound, Government Bacteriologist, was commissioned by the Government to visit the Gulf district, and report on the so-called " redwater" disease, which was just then commencing to devastate some of the station herds.

From the exhaustive inquiries made by Mr. Pound, he arrived at the conclusion that he disease was introduced into the Gulf country from the Northern Territory by cattle tick-infested, but themselves redwater immune, brought to Queensland as the result of the establishment of boiling-down works at Burketown and Normanton (" Queensland Agricultural Journal," June, 1907, Vol. XVIII. pt. 6, p. 283.)

The whole of the evidence which I have been able to secure from official and private sources, although varying slightly in detail, as is to be expected, points to the gradual advancement of the disease redwater, which we know to-day to be tick-borne, and tick-borne only, from the point of its original and earliest appearance—Glencoe Station, some hundred miles south of Darwin. This is exactly what might now be assumed *a priori* would happen given the introduction of ticks by the Brahma cattle, which were turned out near Port Darwin in 1872. They were taken to the Adelaide River, where they rapidly multiplied. During the wet summer months when the lowlying coastal lands are swampy, some, if not all, would seek higher and drier grazing lands inland. Being unable to cross the Adelaide, they would keep to the left bank, some in straying would ultimately reach and mingle with the nearest station cattle at the time, which would be those of Glencoe. Thus they would gradually, but surely, carry the ticks, and so infest the land with the eggs and larvæ. These larvæ, though by virtue of gradual infection of station cattle they might not seriously affect them with the blood parasite, would almost certainly seriously affect fresh non-immune arrivals that would suddenly be attacked by numbers of the skin parasites, and thus the appearance of redwater amongst the Queensland cattle reaching Glencoe about 1880-1881 seems sufficiently accounted for. Not all these cattle would succumb to the fever. Many would be but slightly affected; others would recover, though possibly be left as useless. Such travelled cattle, when they leave the mob, naturally tend to return over the route they have traversed, and seek their original home. In this way the tendency would be for the ticks to become carried further inland and backwards gradually towards the Queensland border, as we see was the case. The whole evidence, although circumstantial, incriminates the

importation of Asiatic cattle by the British-Australian Telegraph Company in 1872 as the actual agent of the introduction of ticks (*Boophilus annulatus,* var. *microplus*) and tick fever (*Babesiasis*) to Australia. As against the likelihood of the Cable Company's importation of Batavian cattle having introduced ticks, I must quote Mr. H. W. H. Stevens's assurance that during the voyage these cattle were daily washed with sea-water, and that no ticks were observed on them during the voyage and on their arrival. This may be so, but so far as the sea-water baths are concerned they would not destroy living ticks, judging by experience of the application of much more potent solutions, and everyone with experience of these parasites knows how easy it is to overlook them when but comparatively few are present. Writing me in regard to this subject, Mr Stevens states: "Although there was a small mob of English cattle depastured at the Jungle, 12 miles from Darwin, belonging to the Government, I never heard any reference to ticks, nor did I see them on these cattle up to the year 1875. We had also milch cows and other stock in the settlement, but it was not until some years later, say 1880, that any trouble from tick was experienced." This is additional proof that ticks were not originally in the Territory. Such cattle were not mixed with the Brahmas, and probably the infection reached Darwin itself by a circuitous route from the native herd on the Adelaide River.

Briefly, my reasons for suspecting this importation of cattle as the introducers of ticks and redwater to Australia are as follows:—

1. All cattle in the Dutch Indies are more or less affected with ticks, although naturally immune to redwater.
2. This is the only importation of native Eastern cattle which have been able to cross with station cattle.
3. These cattle we know travelled inland as far as the Adelaide River.
4. It is more than likely some of their progeny would gradually reach from there the main stock route from the South to Darwin.
5. This point would be somewhere about Glencoe.
6. At Glencoe, about eight years after the introduction of these Eastern cattle, redwater as an epidemic and serious disease first appeared in Australia.
7. The disease redwater only affected travelling non-immune cattle on reaching Glencoe
8. The evidence strongly points to the gradual spread of ticks and redwater to other parts of the continent along the stock routes from this point by cattle, which had been sick and recovered, tending to travel backwards in the direction of their original home, and in this way disseminating the ticks.

(TO BE CONTINUED.)

Statistics.

COMMONWEALTH METEOROLOGY.

RAINFALL OF QUEENSLAND.

Table Showing the Total Fainfall for each Month of the Year in the Agricultural Districts of Queensland.

Stations.	1911.					1912.							
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.
North.													
Ayr	...	...	...	...	...	...	...	3·53	1·16	1·01	6 70	...	...
Bowen	0·15	Nil	1·5	0·19	1·32	1·56	3·15	1 86	0·59	1·76	3·78	...	0·18
Cairns	0·27	0 6	0·88	1·95	0 90	4·81	16·68	5·95	4·71	5·97	8·00	...	2·89
Geraldton (Innisfail)..	0·79	0·30	0·73	1·61	0·75	5·50	18·24	6·01	56·14	41·84	15·25	...	3·39
Gindie State Farm ...	0·49	...	0 81	...	3.50	0·68	2·59	1·88	0·63	...	9 91	3·45	...
Herberton	0·5	Nil	0·9	0·62	5·36	5·29	2·82	1·47	1·40	2·20	2 36	...	1·39
Hughenden	Nil	Nil	Nil	1·37	0·69	5·78	1·84	3·52	Nil.	0·74	6 61	...	Nil
Kamerunga State Nur.	...	...	...	...	...	...	...	...	*	...	...	...	...
Mackay	0·18	0·3	0·93	0·17	0·41	2·08	8·04	·93	3·56	3·42	5·51	...	0·23
Mossman	0·39	0·09	0·55	0·86	3 31	6·06	18·32	17·60	6·40	2·78	8·88	1·33	1 98
Rockhampton	1·17	Nil	0·40	0·6	0·81	2·50	3·24	·14	0·01	1·98	8·38	...	Nil
Townsville	Nil	Nil	0·39	0·31	2·84	1·64	7·57	6·35	4·51	0·63	4·49	...	0·17
South.													
Biggenden State Farm	...	...	...	...	...	...	...	...	...	...	...	...	...
Brisbane	2·22	0 84	4·95	0·84	1·94	1·85	2·13	1·03	0·72	0·20	7·22	...	1·32
Bundaberg	1·15	Nil	2·36	1·30	2·98	3·96	2·47	...	Nil	1·33	10·23	1·76	0·78
Bungeworgorai (Roma State Farm)	...	...	...	...	...	0·73	...	2·19	N .	...	7·06	...	0·33
Crohamhurst	2·62	0·51	6·27	1·74	3·02	5·62	8·72	13·73	1·77	1·39	9·99	1·67	...
Dalby	0·43	0·42	3·45	1·99	1·55	1·76	2·58	·53	Nil.	Nil	4·76	...	0 68
Esk	1·51	2·04	4·17	0·47	0 44	1·38	8·26	·22	0·36	0 11	7·43	...	1·13
Gatton Agric. College	9 90	0·96	3 77	0·49	1·90	3·56	3·31	7·86	1·35	...	6 63	1 84	1·04
Glasshouse Mountains	3·15	0·60	4·58	1·76	1·44	3·37	6·99	13·15	0·31	0·98	7 85	1 86	1·14
Gympie	0·48	0·26	2·42	0·50	2·10	2·92	4·47	·15	0·37	0·52	2 63	...	0·92
Ipswich	1·12	0·34	4·71	0·25	...	1·87	3·00	·41	0·30	Nil	3·93	...	1·02
Maryborough	1·47	0·9	2·81	0·90	4·98	2·39	3·93	·11	0·32	1·09	9·12	...	1·26
Roma	1·55	0·87	1·9	1·55	1·19	0·74	0 76	·85	0·03	Nil	7·96	...	0·77
Tewantin	1·07	0·4	7·48	1·14	2·13	5·60	4·25	·85	0·80	8·46	8·72	...	0·82
Toowoomba	...	...	...	...	...	...	...	·52	0·66	0·16	6 75	...	1·05
Warren State Farm ...	1·01	...	0·64	...	...	0 82	1·75	2·04	0·22	1·28	9 51	3·35	...
Warwick	1·50	0·80	1·78	2·26	0·70	1·57	3·45	·56	0·02	0·9	5·69	...	1·37
Warwick, Hermitage State Farm ...	...	...	0·60	...	...	...	...	...	...	...	...	...	...
Westbrook State Farm	...	...	...	...	...	...	...	...	Nil	...	...	...	...
Woodford	...	...	...	...	...	...	...	...	...	...	9·78	...	...
Yandina	Nil	0·30	2·90	1·36	1·87	5·95	4·84	·95	0·88	1·39	7·42	...	1·25

Note.—The rainfall data in this table are compiled from telegraphic reports, and must be considered as pproximate only. * No Report.

GEORGE G. BOND,
Divisional Officer.

General Notes.

COST OF WORKING COCONUTS.

"Ceylon" writes as follows in "Grenier's Rubber News," of 25th May:—

Perhaps some of your readers would like to hear of the actual working of an estate in my charge. The palms in partial and full bearing are about 80 per cent., the young palms the remaining 20 per cent. The manure now being applied and the system on which it is done will increase the number of nuts enormously. At present the average yield of partial and full-bearing trees is forty-five nuts. The cost of work for the past season has been as follows:—

	Per candy (½ ton). Dol's.	Cts.
Picking, gathering, and carting	1	05
Making coprah	1	97
Borers, beetles, and stem disease	0	82
Propping	1	46
Transport, 1 dollar 12 cents by cart, 2 dollars 25 cents by rail	3	37
Weeding	2	63
Roads and drains	0	20
Manuring (half the estate each year)	7	66
Salaries, visiting, hospital, loss on rice, insurance, watchers, lines, wells, tools, carts and bulls, &c. (general charges)	8	26
	27	42

The average price for coprah in Colombo for the past season was about 80s. (at present it is 86s.), so there remains a profit of about 52 dollars 58 cents per candy. Of course, brokerage and Colombo agency charges have to be deducted.

An estate planted at the rate of 60 to 65 trees to the acres and giving 60 nuts per tree, and taking 1,200 nuts to 1,250 nuts to the candy, would give at least 150s. per acre profit, equal to £10 when in full bearing.

PUBLICATION RECEIVED.

We have received from the authors—H. Hamel Smith (editor of "Tropical Life," London) and F. A. G. Papi—copy of a book on coconut cultivation, entitled "Coconuts, the Consols of the East." Both the above gentlemen have had many years' experience in connection with tropical agriculture, and are, therefore, well qualified to instruct others engaged or about to engage in planting pursuits in the tropics. We have read a great deal on the subject of coconut-growing and coprah-making, but so far nothing has been presented to the planting world, through the Press, equal in exhaustive information on the subject to the work under review. The need for such a book is emphasised by the large increase in coconut-planting in the Pacific Islands, particularly in the Solomons and Papua, where, in many cases, coconuts are being planted in preference to rubber. The authors have spared no pains to show how, on a well-managed coconut estate, where plenty of water

abounds, and the space between the palms allows room for catch crops to flourish, and cattle, hogs, &c., to breed and increase in numbers, the profits to be secured from these subsidiary industries can be made as important perhaps as those arising from the palms themselves. On large estates, in any case, the suggestions thrown out by the joint authors, and the advice and instructions given as to how such estates can be managed to best advantage, are certain to place the book right in the front of the bookshelf of everyone interested in coconuts. The sections on the ultilisation of the by-products, the proposals advanced, in some cases for the first time, how these by-products can be turned to a profit, and the figures given in connection with the instructions how to treat them, will, we feel sure, be carefully studied by every estate manager or owner who wishes to make the most he can out of the property he has charge of. This is, we believe, the first time so exhaustive and so complete a study of the coconut palm has been published. Sections are included dealing with the seed-nuts, nurseries and diseases, need of manuring, &c.; then we come to the question of cattle and catch crops, of making coprah, the extraction of fibre and oil, how to make vinegar, alcohol, &c., the possibilities of paper-making, and so on, until nothing is forgotten; nothing wasted. Undoubtedly, this is the way large estates nowadays must be run if they are to pay. Our readers, therefore, can see that everything that needs discussing in connection with coconut cultivation has been included, with the result that those buying such a book will find everything they need between the covers of the one under review.

We predict a large and ready sale for the book.

TIMES OF SUNRISE AND SUNSET AT BRISBANE—1912.

Date.	September.		October.		November.		December.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·3	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·1	5·34	5·28	5·47	4·58	6·6	4·46	6·29
3	6·0	5·35	5·27	5·48	4·57	6·7	4·46	6·30
4	5·59	5·35	5·26	5·48	4·56	6·8	4·46	6·30
5	5·58	5·36	5·25	5·49	4·55	6·9	4·46	6·31
6	5·57	5·36	5·23	5·50	4·55	6·9	4·47	6·32
7	5·56	5·36	5·22	5·50	4·54	6·10	4·47	6·32
8	5·55	5·37	5·21	5·51	4·54	6·10	4·47	6·33
9	5·54	5·37	5·20	5·51	4·53	6·11	4·47	6·34
10	5·53	5·38	5·19	5·52	4·53	6·11	4·47	6·35
11	5·51	5·38	5·18	5·52	4·52	6·12	4·47	6·35
12	5·50	5·39	5·17	5·53	4·51	6·12	4·48	6·36
13	5·49	5·39	5·16	5·54	4·51	6·13	4·48	6·36
14	5·48	5·40	5·15	5·54	4·50	6·14	4·49	6·37
15	5·47	5·40	5·14	5·55	4·50	6·15	4·49	6·37
16	5·46	5·41	5·13	5·55	4·50	6·16	4·50	6·38
17	5·45	5·41	5·12	5·56	4·49	6·17	4·50	6·39
18	5·44	5·41	5·10	5·56	4·49	6·17	4·50	6·39
19	5·42	5·42	5·9	5·57	4·49	6·18	4·50	6·40
20	5·41	5·42	5·8	5·58	4·48	6·19	4·51	6·41
21	5·40	5·43	5·7	5·58	4·48	6·20	4·51	6·41
22	5·39	5·44	5·6	5·59	4·47	6·21	4·52	6·42
23	5·38	5·44	5·6	6·0	4·47	6·22	4·52	6·42
24	5·37	5·44	5·5	6·0	4·47	6·22	4·53	6·43
25	5·36	5·44	5·4	6·1	4·47	6·23	4·53	6·43
26	5·35	5·44	5·3	6·1	4·47	6·24	4·54	6·44
27	5·33	5·45	5·2	6·2	4·46	6·25	4·54	6·44
28	5·32	5·45	5·2	6·2	4·46	6·26	4·55	6·44
29	5·31	5·46	5·1	6·3	4·46	6·26	4·55	6·45
30	5·30	5·47	5·0	6·3	4·46	6·27	4·56	6·45
31	...	...	5·0	6·4	...	...	4·57	6·45

Phases of the Moon.

			H. M.	
4 Sept.	☽	Last Quarter	11 23	p.m.
11 "	●	New Moon	1 48	"
18 "	☾	First Quarter	5 55	"
26 "	○	Full Moon	9 34	"
4 Oct.	☽	Last Quarter	6 48	a.m.
10 "	●	New Moon	11 41	p.m.
18 "	☾	First Quarter	12 6	"
26 "	○	Full Moon	12 30	"
2 Nov.	☽	Last Quarter	1 37	p.m.
9 "	●	New Moon	12 5	"
17 "	☾	First Quarter	8 43	a.m.
25 "	○	Full Moon	2 12	"
1 Dec.	☽	Last Quarter	5	p.m.
9 "	●	New Moon	3 7	a.m.
17 "	☾	First Quarter	6 6	"
24 "	○	Full Moon	2 30	p.m.
13 "	☽	Last Quarter	6 12	a.m.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR SEPTEMBER, 1912.

Article.		SEPTEMBER. Prices.
Bacon, Pineapple	lb.	$8\frac{1}{2}$d. to 10d.
Bran	ton	£7
Butter	cwt.	110s.
Chaff, Mixed	ton	£7 to £7 10s.
Chaff, Oaten (Victorian)	"	£7 15s. to £8
Chaff, Oaten	"	£7 10s. to £8
Chaff, Wheaten	"	£5 10s.
Cheese	lb.	8d. to $8\frac{1}{4}$d.
Flour	ton	£10
Hay, Oaten (Victorian)	"	£9
Hay, Lucerne	"	£8
Honey	lb.	2d. to $2\frac{1}{2}$d.
Maize	bush.	4s. 6d.
Oats	"	4s. 6d.
Pollard	ton	£7
Potatoes	"	£14
Potatoes, Sweet	cwt.	3s. 6d. to 5s.
Pumpkins	ton	£2 to £3
Wheat, Milling	bush.	5s. 1d. to 5s. 4d.
Onions	ton	£21
Hams	lb.	1s. $1\frac{1}{2}$d.
Eggs	doz.	$8\frac{3}{4}$d. to $9\frac{1}{2}$d.
Fowls	pair	4s. to 4s. 3d.
Geese	"	6s. to 6s. 6d.
Ducks, English	"	4s. to 5s.
Ducks, Muscovy	"	5s. to 6s.
Turkeys (Hens)	"	10s. to 12s.
Turkeys (Gobblers)	"	16s. to 25s.

SOUTHERN FRUIT MARKETS.

Apples (Choice), per case	5s. to 9s.
Apples (Cooking), per case	5s. to 7s. 6d.
Bananas (Fiji), G.M., per case	17s. 6d. to 18s.
Bananas (Fiji), G.M., per bunch	7s. to 8s. 6d.
Bananas (Queensland), per bunch	4s. to 5s. 6d.
Bananas (Queensland) per case	8s. to 12s.
Cocoanuts, per doz.	2s. 6d. to 3s
Custard Apples, per half-case	5s. to 8s.
Lemons (local), per gin case	4s. 6d. to 6s.
Mandarins (Thorney), per half-case	2s. to 4s.
Mandarins (Emperors), per gin case	5s. to 8s.
Oranges (Navels), per gin case	7s. to 15s.
Oranges (main crop), per gin case	5s. to 7s.
Passion Fruit, per half-case	2s. 6d. to 5s. 6d.
Papaw Apples, per case	2s. 6d. to 3s. 6d.
Peanuts, per lb.	$5\frac{1}{2}$d.
Pears, per bushel case	9s. to 15s.
Pineapples (Queensland), common, per half-case	5s. to 8s.
Pineapples (Queensland), Ripley's, per half-case	5s. to 8s.
Pineapples (Queensland), Queen's, per half-case	5s. to 8s.
Tomatoes, per half-case	2s. 6d. to 6s. 6d.
Cucumbers, per bushel case	5s. to 7s. 6d.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Article.	SEPTEMBER. Prices.
Apples (Eating), per case ...	9s. 6d. to 10s. 6d.
Apples (Cooking), per case	7s. to 10s.
Bananas (Cavendish), per dozen ...	3d. to 4d.
Bananas (Sugar), per dozen	2d. to 2¾d.
Cape Gooseberries, per case	3s. to 8s. 6d.
Citrons, per cwt.	12s.
Custard Apples, per quarter-case...	4s. to 5s.
Gooseberries, per quart	7¾d. to 8¼d.
Lemons, per case	6s. to 7s.
Mandarins, per case	7s. to 10s.
Oranges (Navel), per case...	5s. to 7s.
Oranges (Other), per case...	4s. to 6s.
Papaw Apples, per quarter-case ...	1s. to 1s. 6d
Passion Fruit, per quarter-case ...	4s. to 5s.
Peanuts, per lb.	3½d. to 4d.
Pineapples (Ripley), per dozen	1s. 6d. to 2s. 6d.
Pineapples (Rough), per dozen	1s. to 1s. 6d.
Pineapples (Smooth), per dozen ...	2s. 6d. to 4s. 6d.
Strawberries, per dozen pint boxes	4s. to 6s.
Strawberries, per tray	1s. 6d. to 2s.
Tomatoes, per quarter-case	3s. to 7s.

TOP PRICES, ENOGGERA YARDS, AUGUST, 1912.

Animal.	AUGUST. Prices.
Bullocks	£8 17s. 6d. to £9 15s.
" (Single)	£12 10s.
Cows ...	£6 10s. to £7 17s. 6d.
Merino Wethers	27s. 6d.
Crossbred Wethers...	50s.
Merino Ewes	21s. 6d.
Crossbred Ewes	24s.
Lincoln Ewes	25s. 6d.
Lambs	21s.

EXHIBITION SALES.

Animal.	AUGUST. Prices.
Bullock (Champion)	£21 10s.
" (Guessing)...	£26
Merino Wethers	34s.
Crossbred Wethers...	65s.
Merino Ewes	21s.
Crossbred Ewes	46s.
Lambs	40s.

Farm and Garden Notes for November.

FIELD.—Under ordinarily favourable conditions, harvesting the wheat and barley crops may now begin. Those who have oats for hay should cut it when the grain has formed, but before it is ripe, for then the plant is in its most nourishing condition. Destroy caterpillars on tobacco plants, and top the latter so as to throw all the strength into the leaves. Keep down the weeds, which will now try to make headway; earth up any growing crops requiring the operation; sow maize, imphee, setaria, kafir corn, teosinte, sorghum, &c. Plant sweet potatoes, sisal hemp, yams, peanuts, and ginger.

KITCHEN GARDEN.—Why do so few gardeners and farmers grow their own vegetables? This is a question frequently asked by visitors to the farming districts. The reason probably is, that vegetables require a good deal of care and attention, which means also a good deal of time taken from the ordinary farm work. In many cases it pays the farmer better to buy many kinds of vegetables than to grow them himself. The only vegetables grown on many fine farms are cabbages and pumpkins, not to class potatoes under the head. Many people have an idea that European vegetables cannot be grown during the hot summer months, but this is a great fallacy; the Chinese gardeners supply the towns with all kinds of vegetables, except, perhaps, cauliflowers, during the whole of the summer. It is, therefore, clear that, by constant work, plenty of manure, water, and some shade for seedlings, most vegetables can be produced during the hot months from November to March. If your ground has been trenched or deeply dug and well worked, the advantages will be seen during the coming months. It does not pay to work shallow-dug ground. When sowing and planting during this month, give plenty of room between the rows and the plants; otherwise they will be drawn up and worthless, and keep the ground open by constant forking and hoeing. Thin out melon and cucumber plants. It is a good plan to peg down the vines; they will then not be blown about by the wind; they will take root at intervals, and thus help the main stalk. Give plenty of water to tomatoes planted out last month. They should also be mulched. Sow cabbage, French beans, melons, lettuce, radishes, pumpkins, cucumbers, marrows, rosellas, &c.; and transplant for succession in calm cloudy weather.

FLOWER GARDEN.—Stake any dahlias which may be now above ground, and plant out the bulbs which were stored in a moist place. If the weaker bulbs are reserved, they will come in for autumn planting. Take up all bulbs which have done flowering, and store them in a dry place. Winter-flowering plants will have gone off almost; still, the garden should be in full bloom, and will well repay the trouble bestowed

on it, and a little fertiliser given as a top-dressing will assist the plants to bloom and look well for a longer time than if they were neglected. Give weak liquid manure to chrysanthemums, and allow no suckers to grow till the plants have done flowering. Take up narcissi. Do not store them, but plant them at once in new situations. Sow antirrhinum, balsam, zinnia, summer chrysanthemum, calliopsis, and nemophila.

Orchard Notes for November.

THE SOUTHERN COAST DISTRICTS.

November is somewhat of an off month for fruit, as the crop of strawberries is about over; pineapples, with the exception of a few off season fruit, are not ready for marketing; and citrus fruits of all sorts, with the exception of those grown in the latest districts, are now over. Bananas should, however, be improving, particularly if the season is favourable.

The most important work of the month is the cultivation of the orchard, as, in order to retain moisture in the soil, it is essential that the soil be kept in a fine state of tilth. Where land is liable to wash, breaks should be left between the fine-worked land, or, even better, a good break of cowpea or other leguminous crop, valuable for producing nitrogen and humus, should be grown. All fruit pests should be attended to; cyaniding can be carried out where necessary, and is especially useful now in the case of the Red, Purple Mussel, Circular Black, and Glover Scales. Fruit fly should be systematically fought; all infested plums, peaches, guavas, or other fruits should be gathered and destroyed, so as to prevent the spread of the pest. Sucking bugs of all sorts should be gathered and destroyed, the egg-clusters, as well as the immature and mature insects, being destroyed. Hand-gathering is as good a plan as any. Fig beetles should be destroyed by spraying with Kedzie's mixture; and the egg-clusters should be destroyed whenever found.

Bananas and pineapples can be planted during the month, taking care, in the case of the pineapples, not to set out suckers that will immediately throw out a fruit, but those that will become firmly established before they fruit. Examine the vineyard carefully, and keep it well worked. Look out for Oïdium and Black Spot, and treat for same as recommended in the Orchard Notes of the two previous months.

Early ripening grapes will be reaching maturity towards the end of the month; but few, if any, will be ripe. In any case do not market too immature fruit; rather wait a few days longer, till it is fit to eat.

THE TROPICAL COAST DISTRICTS.

The main crop of pineapples will ripen during the month; and if gathered at the right time—viz., when fully developed, but not turned colour—they will carry all right South, if carefully handled and well packed. Papaws and granadillas are still in season, and will meet with a good Southern demand; they must be packed in cases containing only a single layer of fruit, and should be sent in the cool chamber. I am certain that a good market can be got for these fruits in both Melbourne and Sydney, particularly at this time of the year, when their winter fruits are off and their summer fruits are not yet on.

Watch bananas carefully for fly. Keep the orchards well cultivated.

Only ship good mangoes South; far too much rubbish is sent to Brisbane. Good mangoes will pay to pack properly, but the common sorts, which predominate to an enormous extent, will barely pay freight, if there is a good crop. The canning of good types of fibreless mangoes of good flavour is well worth taking up commercially in the North, as a ready sale for the canned fruits can be obtained.

As in the Southern Coast districts, all fruit pests should be systematically fought, and the orchard should be kept in a good state of tilth, as, once the wet season starts, there is little chance of cleaning up weeds and rubbish of all kinds, or of cultivating and sweetening the soil.

THE SOUTHERN AND CENTRAL TABLELANDS.

The earlier kinds of summer fruits, such as cherries, will ripen during the month. See that, if fruit fly makes its appearance, it is systematically fought.

Look out for Codling Moth, and continue the sprayings with Kedzie's mixture.

Look out carefully for any San José scale that may have escaped the winter spraying, as, if the trees are sprayed whilst the young are hatching out, the bulk of the insects are killed and little damage is done either to tree or fruit.

The sulphide of soda spray is one of the best to use now. Keep Woolly Aphis in check, should it make its appearance, using the resin washes; or, if it and San José scale are both present, use the sulphide of soda spray.

Watch the vineyards carefully for Black Spot and Oïdium. Keep the orchard and vineyard well cultivated, so as to retain all the moisture in the soil required for the growth of the tree and development of the fruit. In the warmer parts, irrigate when necessary, following the irrigation by deep and systematic cultivation.

See that grape vines have plenty of foliage to protect the ripening fruit from sun scald, but yet not so dense a foliage as to induce Oïdium or Black Spot. Look out for Red Scale on citrus trees, and cyanide to check same. Look out for fruit fly in the early ripening fruits, and gather and destroy all that may be so affected.

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Agriculture.

THE FARMER'S SHEEP.

By W. G. BROWN, Sheep and Wool Expert.

I have before me a circular issued by the Bradford Chamber of Commerce, and signed by the Chairman of the Wool-trade Section of that body, calling attention to the fact that grey and black hairs are becoming increasingly prevalent in all classes of wool.

According to the circular, it was pointed out by many speakers that these black and grey hairs are found in the staple, and are chiefly due to the practice of breeding from the Shropshire and Downs types of sheep. . . . . These blacks hairs are comparatively few in number, but are so spread amongst the white ones as to render it impossible to take them out by sorting, and are therefore most deleterious for all but the cheapest or darkest kinds of cloths. They urged therefore upon all growers—

1st. That farmers should not breed from black or grey sheep.

2nd. That the greatest care should be taken in selecting rams from flocks as free from black hairs as possible.

3rd. That black and grey lambs be slaughtered.

This shows the extreme difficulty of selecting any one class of sheep to suit all purposes. On the one hand, as was stated in a former article (*Queensland Agricultural Journal* for September, p. 230), the butchers

and meat exporters advise the breeders that the Shropshire ram on crossbred ewes gives the best lamb, and the Wool Section of the Chamber of Commerce in Bradford, the capital of the world's wool industry, says:—"Do not breed from the Shropshire or other Downs breeds," because they have black or grey hairs.

In Queensland, fortunately, sheep of all kinds improve, and it is possible, especially on the Downs, to see different types of animals of varying breeds thriving in the same district on the same class of country and under exactly similar conditions. One man may own and prefer Lincolns; his neighbour, Border Leicesters; another neighbour, Merinos; and so on—each swearing by his particular breed, and each, probably, right, because climatic and other conditions are in favour of any kind of sheep on the Downs, when they are fed on cultivated land.

Thus the evidence we have gathered may be condensed. Mr. J. W. Matthews' tables, in the experiment at Wagga Wagga, show the South Downs to be the best at per lb. These sheep also mature early. The Dorset Horn makes the highest price for carcass, owing to its greater weight, and the Suffolks are extremely early maturers, fecund, and hardy. They are distinctly not a wool sheep, but, like the Shropshire, are liable, if "left over," to give little and inferior wool. The Shrops are liked by the butchers, but disliked by the spinners and dyers i England and elsewhere, for reasons given above.

The English and Border Leicester are comparatively early maturers, have good wool, and, comparatively, a good deal of it; they are early maturers and prolific. The Romneys have decent wool, big carcass, and do well on rough country. A farmer's sheep should be a big eater, and it has been shown that the South Down is a dainty feeder. The Dorset Horn is a good doer on good feed; the Suffolk, voracious; and this quality is possessed by the Leicester, Border Leicester, and Lincoln. These last three breeds possess good white wool and plenty of it; and the Leicester and Border Leicester possess early-maturing qualities.

Taking all things into consideration, given a Lincoln-*cum*-Merino ewe, the farmer who uses the English Leicester or Border Leicester will not be ashamed of the resultant lamb, either in price or early maturity, and will have a payable fleece as well, from the mother.

Thus, for the first cross, Lincoln on Merino; and for the second, or lamb raisers' cross, Border Leicester or English Leicester on the first cross.

In connection with the Lincoln-Merino cross, it is exceedingly difficult to get a run of, say, 1,000 crossbred ewes of one drop and earmark of any kind in Queensland; and I have been advising many of the Western selectors, when they have ewes for sale, to put one of the long-wool breeds of rams to these ewes, and sell them in lamb on the Downs. I am sure that this would enhance the value of the ewes far more than if they were empty or in lamb to Merino rams.

The experience of one very successful and practical sheep-farmer may be given here. I had it from his own lips, and saw, just before the rain came in June last, 426 fat lambs sold on his farm for 11s. each. They were about five months to six months old. All through the dry spell he was selling fat lambs and sheep at regular intervals. His method is as follows:—He bought Merino ewes to begin with. These had 70 per cent. of lambs at foot by Merino rams. Immediately on their arrival at the farm, he put Leicester rams to the ewes, and a little later, sold the weaned lambs for 5s. each. Five or six months later, he had a very good drop of crossbred lambs, about 80 per cent.; and five months later again, he sold these for an average of 10s. each on the ground. The net result was:—

	£ s. d.	£ s. d.
1,200 Merino ewes (lambs given in), at 15s.	..	900 0 0
70 per cent. Merino lambs sold, 840 at 5s. each	210 0 0	
Fleeces off ewes, 1,200 at 5s. each	300 0 0	
80 per cent. of crossbred lambs, 960 at 10s. each	480 0 0	
1,190 eyes fattened off, and sold at 12s. each	714 0 0	1,704 0 0
Balance credit on transaction ..	..	£804 0 0

This was done on about 400 acres of lucerne; and besides this, expenses of cultivation, &c., were more than covered by sales of surplus hay at the drought prices ruling last autumn. The thing was done, and these results put on record before the Meat Commission, where the gentleman in question gave most important evidence in regard to the fat lamb business. It is not a fancy picture. This is only one year's operations, in a year when most farmers in the same neighbourhood lost heavily owing to dry weather. Other years showed still better results, he tells me. It will be noticed that he bred and sold, as fat lambs, the *first* cross, and had not the slightest difficulty in disposing of them.

Recently, too, the newspapers told of Mr. Pullen, of Wyarra, selling a draft of fat lambs for 20s. each, and that in Sydney. The journey occupied three days from the Downs to Homebush! Surely, fat lambs can be grown at a profit by farmers on the Downs.

I have met at least a dozen men who have done as well, or nearly as well, as those I have mentioned. In New Zealand, a prediction was made in 1877 that the country would carry 15,000,000 of sheep when stocked fully, and everybody laughed. In 1911, there were 24,269,000! And the business still is expanding. From 1902 to 1911 the export of fat lambs and sheep rose from 2,077,581 in the first-named year, to 4,173,014 in 1911. These facts were taken from the New Zealand Year Book for 1912. There are 766 registered stud flocks of the six British breeds used over there, in the North and South Islands. The time is rapidly approaching when Queensland will have her registered stud flocks too.

[TO BE CONTINUED.]

PLATE 37.—LOADING WOOL AT KINNOUL WOOLSHED, TAROOM.

PLATE 38.—WOOL-SORTING AT KINNOUL WOOLSHED, TAROOM.

DYNAMITE ON THE FARM.

Last month we ("Garden and Field") reprinted a letter on the various uses of dynamite in soil preparation. From the same source—"The South African Journal of Agriculture"—we take the following interesting editorial comments:—

Since the appearance of the last issue, containing a contribution by Mr. Kenneth B. Quinan, general manager of the Cape Explosives Works, Somerset West, Cape Province, on the use of dynamite in agriculture, we have had opportunities of witnessing several very interesting demonstrations bearing on the subject. The first we saw was carried out by Mr. Wingate Wright, of Johannesburg, on Mr. Russell's farm at Birchleigh, a wayside station close to Zuurfontein, on the Pretoria-Johannesburg Railway. The conditions here were sufficiently typical of the high veld to give a very fair idea of the possible value of this particular method to farmers in similar circumstances. The soil is a deep loam, and, when the experiments were carried out, was in a suitable condition to show sound results—that is to say, the spot selected was dry, and the subsoil seemed well compacted. The method adopted by Mr. Wright was to bore holes a little more than half an inch in diameter to depths varying from about 3 ft. 6 in. to about 5 ft. 6 in. In each hole he lowered one cartridge, weighing about 2 oz., of ordinary gelignite, the blasting compound used for rock-breaking in the mines. Prior to lowering, the usual detonator was, of course, attached to the cartridge in the ordinary way, and the necessary length of fuse to allow of same being lighted to explode the charge. The hole was then tamped with damp earth, and the fuse lighted. The effect of the explosion in the deeper holes was not much marked on the surface, and the ground being so hard it was difficult to dig down to the lower depths to see what had happened below. But the effects of the charges in the shallower holes—say from 3 ft. 6 in. to 4 ft.—was more satisfactory, as not only could the result be noticed on the surface, but the action of the explosive was such that the ground was easily removed with a spade, and cracks and fissures could be traced in some instances as far as 6 to 7 ft. from the centre of the explosion. On removing the top soil, the effect on the subsoil was most marked and highly satisfactory; it is doubtful if it would have been possible to get a plough into this particular piece of ground in the condition it then presented, so that here, at least, was the beginning of the solution of one of this country's serious cultural problems.

The work done by Wright must be taken as of an entirely experimental character, for, though an expert in the handling of explosives for other purposes, he is, we believe, more or less of an amateur in conducting agricultural operations by its means. In addition to this, it has to be remembered that he was further handicapped in that he had to fix up all the implements for this purpose. His method of sinking the holes, for instance, was to use an auger which he had to have specially made. Though this was effective, the results of later demonstrations we had the pleasure of seeing show that the work of sinking the holes for the charges can be done better and with more expedition by other means. The explosive he applied is also quite different to that which has been

brought into use for this purpose. Therefore, considering all the circumstances, Mr. Wright's experiments may be taken as even more successful than they appeared, and it is hoped that may lead to encourage others to follow them up on a field scale. We understand that Mr. Russell intends giving the system a fair trial at no distant date. That he and others similarly situated should be encouraged to carry on this work is amply shown by the results which have been obtained not only in America, where these practices are quite common, but in the districts of the Western Province of the Cape, where Mr. Quinan has been carrying out some exceedingly valuable demonstration work, as related in our last issue.

The result of a personal attendance at some of Mr. Quinan's demonstrations, and considerable discussion with that gentleman and members of his staff, has impressed us deeply with the conviction that this method of subsoiling should prove of incalculable value to many parts of South Africa. But, to assure success, the work must be carefully and properly handled, and "rule of thumb" will have to be carefully avoided. In other words, everything must be adjusted to the local conditions of soil and climate, and from the first nothing but the correct implements and the correct explosive used. The fact has been noted that Mr. Wright used gelignite, a highly powerful compound. That gentleman, of course, used that article because it was easiest obtainable for his experiments. Now, the make of explosive used for these purposes in America is what has come to be known as agricultural dynamite, a blasting compound which acts in a different manner to gelignite. As the latter is made specially for blasting rock, its explosive velocity is very high. Its action in soil is accordingly rather different to that of the specially compounded agricultural dynamite, which is specially made to use in soil instead of rock. In other words, the agricultural blasting compound explodes slower than the rock-blasting compound. Therefore, anyone who is desirous of going in for this system should see that the right explosive is obtained. It can be manufactured by any explosive factory; but, so far as we are aware, the Cape factory is the only one turning it out in this country at present.

The necessity of paying careful attention to this detail was fully apparent at demonstrations we had the pleasure of witnessing at the Government Viticultural Station, at Paarl and on Sir Thomas Smart's farm at Stellenbosch. Though the ground at each of these places was not in such a favourable condition for blasting as was that at Birchleigh, the results from the point of view of the agriculturist were more satisfactory. The explosions in most cases (except in the holes where specially heavy charges were used to show what could be done, if so desired, for deep trenching purposes) were only just noticeable at the surface, the actual soil displacement being scarcely as great as that of an ordinary mole-hill. But when the soil was opened up, it was found to be fissured and shaken in all directions; and in those cases where holes were sunk to demonstrate its uses for tree or vine planting, there was a regular pot-hole below, sufficient to satisfy the most exacting. Again, when the holes were left undisturbed, columns of smoke were noticed to gradually rise

out of the ground through the cracks and fissures, demonstrating the extent of the underground shock. And all this occurred, though one could almost stand over the hole while the explosion took place. Of course, no one did so, but that was the impression the operation left on all who were present. At the same time, the shock below ground was distinctly felt for some distance. This seems to be the cardinal difference between using gelignite, a high-velocity explosive, and this specially prepared agricultural dynamite or low-velocity explosive. In this case the ground was very wet and elastic from recent rains, so it is only fair to assume that had the ground been dry the results would have been even more satisfactory so far as the subsoil disturbances were concerned, for explosives act with better effect in dry ground.

Another great difference between the method shown at Birchleigh and those in use by Mr. Quinan was in the actual implements employed. At Birchleigh an auger was used to make the hole; Mr. Quinan uses an ordinary drill driven into the ground by a heavy hammer. The drill is over 1 in. in diameter, and is made of the best hardened steel. The point is set rather short, but it will make its way into anything short of the very hardest rock in very quick time. The holes are punched into the soil, and they are made very quickly and at very little cost. The only trouble is getting the drill out again, but that is overcome by a very ingeniously contrived little implement in the shape of a grip on the fulcrum and lever principle. So that all the outfit needed is one of these specially made drills, a 10-lb. hammer, and the grip. The lever can be supplied on the farm by using a piece of strong hardwood—say, an old disselboom—resting on a couple of blocks of similar material. The set complete—including hammers for driving the drill into the ground, and appliance for cutting the fuse and fixing the detonators on the cartridges —costs, we understand, something less than £3. And with this a couple of ordinary farm hands, even raw Kaffirs, can make the holes at a great pace, once the selected spots are marked out. After the holes are made, the rest is quite simple. The preparation of the dynamite cartridge is not difficult, consisting of fitting the detonator and fuse. A wooden tamping rod is all that is necessary for setting the charge in the hole, and an ordinary broom-handle serves this purpose. It is necessary to be careful in tamping the charge in the hole, otherwise some of the effect of the explosion may be lost, but all these details can be learned from a special booklet which Mr. Quinan is issuing shortly, and which we had the pleasure of looking over in advance proofs. So that any one wanting fuller particulars can obtain them on writing to the General Manager of the Cape Explosives Works, Somerset West, Cape Province.

The real considerations for the practical agriculturist are, however, not so much the details given above, as the further consideration of how the system there outlined is likely to affect him in his industrial operations. All that can be said at this stage is it looks very promising. The actual benefits can only be shown by trial and experiment. This much further can be said, however: That in certain well-recognised and well-known conditions in this country the use of this method of subsoiling can only result in certain advantage. In heavy, stiff, compacted clays, it is

bound to act beneficially, provided the soils are deep. In those cases where continuous ploughing has left what is known as a "hard pan," it is impossible to conceive of a better or easier method of restoring soil fertility by breaking up the lower strata and thus rendering available the latent stores of plant food. For the establishment of orchards or vineyards, where heavy and expensive trenching work is now necessary, hand-spading being the only means available, this system should prove both cheap and effective—in fact, in a dozen different ways there should be both advantage and profit in its use. But there are conditions in which its use might, conceivably, be attended with results far from beneficial. And there are other conditions where no benefit might follow, though no actual harm would be done. It has always to be remembered that certain classes of soil may not be benefited by the disruption of the lower strata, while others, again, would be greatly improved. In short, this system needs to be most carefully experimented with, except in those cases where the conditions point distinctly to the possibility of improvement. To give two probable cases in point: Some of the Karoo silts in the river valleys of the Cape Province set so hard that the crying need of subsoiling has been felt for years. In such a case this system should work well. There are others of these same silts so loose and friable that it is doubtful if any advantage would be gained, even if positive harm did not follow. It must never be forgotten that it is possible to over-drain certain types of soils, just as it is possible to have others too closely impacted. And that is just the one point to be guarded against in this system, for in loose, light, well-drained soils with, say, a gravel or boulder drift bed, there is always the chance of this occurring.

If all that is claimed for this method of opening up soils proves to be correct, and, on the face of things, there seems little reason to cast doubt upon the statements put forward, there is a great future for the system in South Africa. The majority of the practical men who have seen the demonstrations have been convinced that there is a great deal in it, and many have already started trials on a fairly large scale. It is to be hoped that others will follow suit, and not only carry out the work, but keep careful records and let the country know exactly what the results may be when the crops come in. There are many sets of conditions where much could be done, notably in some of the older established lucerne lands, that would bring comparative results in a fairly short time, and we hope to see a set afoot as soon as possible with that object in view. Another set of experiments that should be promising would be the treatment of "brak" soils by this method. Given a sufficiency of water and this method of subsoiling, and it would be a very obstinate case of "brak" that would not be improved. This, of course, opens up the allied question of sour or acid soils. But that is too large an issue to be discussed lightly or briefly. No possible harm could, however, accrue from a few carefully arranged experiments, for on their successful result great industrial and even social problems might hinge. Much of the best districts of this country, so far as rainfall is concerned, are more or less "sour," especially near the coast; and if the opening up of the subsoils offered any prospect of palliation, it might pay to bring more of these

sections under cultivation, even though they had to be heavily limed to complete the cure. In any case, the use of this particular class of dynamite for agricultural purposes has, we feel, come to stay in South Africa, and it would be as well for all interested in increasing production and restoring soil fertility to watch with care the result of the experimental work now being carried on. The question of cost has been fully gone into, and we can state positively that in most parts of the Union this should not prove prohibitive; but information under this heading and all other particulars may be obtained on writing to M. Quinan at the address given above.

As far as South Australia is concerned, Messrs. Charles Atkins and Co., of Currie street, are, we believe, interested in this question, and would no doubt be pleased to supply information.

SULPHUR AS A MANURE.

The following article, describing investigations regarding this subject (says the "Agricultural News," Barbados, for 3rd August, 1912), appeared in the "Gardeners' Chronicle," for 15th June, 1912. It may be read with interest in connection with the articles on the supply of sulphur to cutlivated crops, and on soil sterilisation, in the "Agricultural News," Vols. X., p. 241, and IX., pp. 17 and 33.

Experiments made by M. E. Boullanger, reported in the "Comptes Rendus" of the French Academy of Science, and summarised in "Die Gartenwelt" (XVI., 17, p. 228), tend to show that the application of small quantities of flowers of sulphur to the soil results in a very considerable increase in the crop grown on that soil. As a result of the addition of flowers of sulphur at the rate of 7 decigrams to 30 kilograms of soil, M. Boullanger claims that the plants experimented with—beet, beans, celery, potatoes, spinach, and others—gave a higher yield of produce than the control plants grown in unsulphured soil.

Nor is that all: according to M. Boullanger's experiments, the yield from the soil treated with sulphur, but otherwise unmanured, was actually greater than that from soil which received a complete manure. When both complete manure and sulphur were added, the best results of all were obtained. One example will suffice to show the extent to which sulphuring the soil increased its fertility. The number to be given represent the results (in grams) in the case of celery:—

No Manure.	Sulphur only.	Complete Manure.	Complete Manure and Sulphur.
60	635	398	676

The increase of yield in the case of the soil treated with sulphur is indeed remarkable, and if further experiment confirms M. Boullanger's conclusions, we shall have to add flowers of sulphur to the list of artificial fertilisers indispensable to the garden.

Apart from the practical aspect of the discovery—which, we repeat, yet awaits full confirmation—the question arises as to the mode of

action of sulphur in enhancing soil fertility. M. Boullanger has himself supplied the clue to the answer to the question. By means of a series of experiments involving the use of sulphured and unsulphured soils, he was able to demonstrate that sulphur produced its stimulating effect on plant growth only in soil which was not heat sterilised. When soil to which sulphur had been added was sterilised by heat it gave no larger crop than that yielded by unsterilised, unsulphured soil. The yields obtained in these experiments were, in round numbers:—

Not sterilised soil	15 grams.
Sulphured, not sterilised soil	25 grams.
Sterilised soil	15 grams.
Sulphured and sterilised soil	16 grams.

Whence it is to be concluded that the beneficent effect of the sulphur is due to its action on some of the living constituents of the soil, possibly on certain races of soil bacteria. The experiments, especially when considered in conjunction with those of other observers, open a promising field for further investigation.

A GIANT OAT.

There is growing in Lancashire on Garton's seed grounds at Warrington (says the London "Daily Mail") a single oat plant which surpasses by several hundred points any cereal ever produced in the world. The single head contains a few short of 1,000 grains, ten times as many as you will find in the best crops. The plant is a more or less accidental result of the original system of what may be called accelerated evolution, which has been practised on these grounds for the last twenty-seven years. This particular prodigy has been obtained by crossing highly-developed oats with the wild oats, which has an incalculable capacity for bearing seeds. These are small and useless, but the strange fact has been discovered that the wild oat may in crossing even enlarge the grain of the cross, as well as increase the number. This particular oat is but an extreme instance of the new productions in cereals of all sorts. It is an indisputable fact, though practical farmers will have difficulty in believing it, that on these grounds oat crops of 160 bushels to the acre—that is, twice the weight of a high average of present crops—have been reaped without any artificial manure or any intensive cultivation. It may be years before the most prolific of these grains come into commerce; but a juncture has been reached when a great part of the world has suddenly come to see that England is the greatest plant-breeding country in the world, even greater in plant-breeding than animal breeding. Especially in Denmark and the United States have these scientific results at Warrington caused a sensation, and this pitch certainly has been reached, that each country can get from England just what it requires—a large ear, or short straw, or loose husk or tight, and is now being supplied.—"Garden and Field."

THE CULTIVATION OF MAIZE IN QUEENSLAND.

A question which is often put to me, and one which I answered fully in the May issue of the "Queensland Agricultural Journal," 1909, is—

WHAT MAIZE ACREAGE IS NEEDED FOR VARIOUS SILOS?

The answer to this question is given in the following table:—

No. of Cows.	Estimated Consumption of Silage Tons.	Size of Silo Needed. Diam. Height.	Average Acres Maize Needed.
6	20	9 x 20 10 x 16	1 to 2
9	30	10 x 22 11 x 20	2 to 3
13	45	10 x 29 11 x 25 12 x 22 13 x 20	3 to 4
21	74	11 x 37 12 x 32 13 x 29 15 x 24 16 x 22	5 to 6
25	90	12 x 38 13 x 33 14 x 30 15 x 27 16 x 25	6 to 7
30	108	13 x 38 14 x 34 15 x 30 16 x 28 17 x 26	8 to 9
35	126	15 x 35 16 x 31 17 x 29	9 to 10
40	144	16 x 35 17 x 31 18 x 29	10 to 11
45	162	18 x 32 19 x 29	11 to 12
50	150	17 x 38 18 x 34	12 to 13

Another question of some importance is—

HOW MUCH WILL MAIZE SHRINK?

All farmers are aware that the longer they keep their corn the lighter it will get, and hence it is to their advantage to get rid of the new crop as quickly as possible, unless in the face of a rising market. Some years ago an experiment was made by Professor Atkinson at the Iowa (U.S.A.) Experiment Station to ascertain the amount of moisture contained in a cob (ear) of corn. A crib was constructed upon the platform of a pair of scales. Seven thousand pounds of corn were husked and placed in the crib. Once each week for a year it was weighed. During the first three months the loss was 630 lb., or 9 per cent. of the original weight. During the next three months the loss was 390 lb., or 5 per cent. of the original weight. During the next three months the loss was 220 lb., and the last three showed a further loss of

190 lb. The total loss during the year was 1,430 lb., or a trifle more than 20 per cent. This means that a bushel of corn weighing 80 lb. when husked will weigh 64 lb. at the end of the year, and the standard sale weight is reduced to 56 lb. per bushel. The general rule for estimating the shrinkage of maize is to put the loss at from 7 to 8 per cent.

From an experiment, however, made by a most methodical farmer in the United States, a new light is thrown on the subject. He weighed one crib of corn when he put it up. The first load was cribbed on the 9th day of October, and the last on the 22nd October. The total amount of corn cribbed was 34,970 lb. The first load was hauled out on the 8th January, and the last on the 1st February. The total hauled out was 29,995 lb., showing a shrinkage of 4,995 lb., or 14 per cent. It would be interesting if such experiments were made by practical men in Queensland, but our farmers are very little given to making experiments; they leave it to the Department of Agriculture and the State Farms.

The climatic conditions being somewhat different here to those of parts of the United States, it might be shown that a lesser—or, possibly, a greater—shrinkage would be shown.

Now concerning

THE COST OF GROWING MAIZE.

Mr. W. D. Lamb, of Yangan, set it down about three years ago at £2 1s. 8d. per acre, the yield at 40 bushels per acre, at 2s. 3d. per bushel, and the net profit at £2 8s. 4d.

But at the present time of writing, maize is worth 4s. per bushel, and we know that the price of maize fluctuates with the demand and supply. Besides this, farm wages have been considerably raised of late, and both of these are factors in increasing the cost of production, and in increasing the monetary return. Again, improved methods of cultivation have raised the yield of grain per acre, and although statistical returns may show an average yield of 20 bushels per acre, yet 50, 60, and 80 bushels are frequently obtained in many parts of the State.

In the issue of the "Queensland Agricultural Journal" for April, 1912, the cost of growing 150 acres of maize was shown as follows:—

MAIZE FOR GRAIN.

	£	s.	d.
150 acres maize, ploughing, at 8s. per acre	60	0	0
150 acres second ploughing, at 5s. per acre	37	10	0
Cultivating 150 acres, at 3s. per acre	30	0	0
150 acres harrowing, at 2s. 6d. per acre	18	15	0
Scuffling 150 acres twice, at 4s. per acre	30	0	0
Pulling or stacking 150 acres maize, at 7s. per acre ..	52	10	0
2,000 sacks, at 6d.	50	0	0
Carting to railway 2,000 sacks, 4 miles, at 6d.	50	0	0
Thrashing 2,000 bags, at 6d.	50	0	0
	£378	15	0

or about £2 10s. 8d. per acre, exclusive of interest.

With a crop yielding 40 bushels per acre, or 6,000 bushels, at 3s. per bushel, the return is £900, leaving a net profit of £521 5s., or £3 9s. 8d. per acre.

LARGE YIELDS.

We often hear of yields of 80 to 100 bushels of maize per acre, and that such yields have been obtained I know from my own practical experience in Queensland. Let us see how the American corn-growers obtain average yields of over 100 bushels per acre. We will take one authenticated case as typical of many.

So long ago as 1889, the *American Agriculturist* offered, among other prizes, one of 500 dollars (£100) for the largest yield on an acre of corn. The crop in each instance was grown on not less than one acre of land, and a complete record was kept of the work of preparing the land, fertilising, labour, &c. The harvesting was done in the presence of three disinterested witnesses, who measured the product, and whose report was formally prepared and sworn to. Forty-five farmers filed competitive reports, and the average yield of crib-cured, shelled corn for the forty-five was 89 bushels per acre. The largest yield was secured by a competitor in South Carolina, who grew 239 bushels of cured, shelled corn on one acre of land, or 217 bushels free of all water. This is probably the largest yield on record. The land on which the crop was grown was sandy in character, the original forest consisting of oak, hickory, and pine. It was well drained naturally. The soil "was a fair specimen of much of the poor land in the South," and for the two previous seasons had produced nothing in one year, and only 5 bushels per acre in the next. The following table shows how this acre was fertilised for the prize crop, and what the fertilisers cost:—

	Dollars.
1,000 bushels stable manure	50.00
867 lb. kainit	7.80
867 lb. cottonseed meal	10.80
200 lb. acid phosphate..	2.00
1,066 lb. manipulated guano	13.32
200 lb. animal bone	4.00
400 lb. nitrate of soda	12.00
600 bushels cotton seed	120.00
Cost of application	7.00
Total cost	$226.92, or £45 8s.

There were other items of expense, such as labour, interest on land, &c., amounting to 37·50 dollars, bringing the total cost of the crop to 264·42 dollars, or £52 18s. 6d.

At that time, in South Carolina, corn was valued at 75 cents (3s. 1½d.) per bushel, which makes the grain worth 191·16 dollars, and adding the fodder value, 15 dollars, makes a total of 206·16 dollars, or £41 4s. 10d. value in receipts.

The method adopted was:—In February stable manure was hauled on to the land, followed by applications of guano, cottonseed meal, and kainit. The land was then ploughed, and following the plough, cottonseed meal was strewn in the furrows. A subsoil plough came after, breaking the soil to a depth of 12 in. One bushel of Southern White Dent corn was

planted on March 2. The rows were furrowed out alternately, 3 and 6 ft. apart, and five or six kernels were dropped to each foot of the row. Between the wide rows, later on, in May, guano was applied, and then in June a mixture of 500 lb. guano, cottonseed meal, and kainit was spread in the wide spaces. Still later, in June, 100 lb. of nitrate of soda was scattered between the narrow rows and hoed in. Frequent cultivation was employed, but the land was kept flat instead of ridged. The plants grew so large that it became necessary to erect posts and nail battens to them on both sides of the row to prevent the stalks from falling. The successful competitor won not only the 500 dollars offered by the *American Agriculturist,* but also an additional 500 dollars offered by the South Carolina Board of Agriculture to the person who would bring the first prize to that State. The second-prize taker produced 191 bushels of dried, shelled grain at a cost of 55 dollars, or £11; and the third prize went to the grower of 151 bushels at a cost of 49·70 dollars, or £9 19s. 7d.

These were certainly fine results, but the first prize man made a loss of £11 13s. 8d. on his acre, the second cleared £18 16s. 10½d., and the third cleared £13 12s. 3½d. per acre.

As far as value per acre is concerned, much greater profits have been made in Queensland on the rich soils of the corn belt, both in the North and South. I have grown 80 bushels per acre on newly-felled scrub land near Brisbane, the only cost being for seed, planting, chipping, harvesting, shelling, bagging, and marketing. The price obtained was 6s. per bushel, or at the rate of £24 per acre. Again, at Gilberton, in North Queensland, a few years ago, a farmer harvested over 100 bushels per acre, at a time when maize in the North brought 7s. to 8s. per bushel. This leads to the subject of

MANURES FOR MAIZE.

Throughout the so-called maize belt, which practically includes the whole State, the manuring of maize lands has not yet been found to be a necessity in Queensland, the reason being that only the best and richest lands have been devoted to this crop. Such lands are either scrub lands on the banks of rivers and creeks, or inland, and the deep fertile volcanic red, black, and chocolate soils of the Downs country and elsewhere, and alluvial flats, which are found in all parts of the State. On such lands, no necessity has arisen for systematic manuring. Where maize has been planted on poorer soils manure in some form or other has been used.

Experience has shown that, where stable manure is not available, good crops have resulted by using the following artificial fertilisers per acre:—

No. 1.	Cost per acre.
160 lb. sulphate of potash	24s.
160 lb. superphosphate	12s.
	36s.

No. 2.

	Cost per acre.
160 lb. nitrate of soda	24s.
320 lb. superphosphate	24s.
160 lb. sulphate of potash	24s.
	72s.

No. 1 is not a complete manure, and requires the addition of nitrogen in the form of nitrate of soda, or of dried blood, to give good results.

No. 2 is a complete manure, but contains too much superphosphate.

No. 3.

Mr. J. C. Brünnich, Agricultural Chemist, Department of Agriculture and Stock, recommends as a general complete fertiliser, per acre:—

	Cost per acre.
1½ cwt. nitrate of soda	24s.
1 cwt. potassium sulphate	16s.
1 cwt. superphosphate	8s.
	78s.

These are all quick-acting soluble manures, and will chiefly benefit the crop to which they are applied.

Corn removes the largest quantity of nitrogen from the soil, followed by hay, wheat, and oats, in the order given.

The use of lime at the rate of 20 bushels per acre has been shown in the United States to give a marked increase in the yield.

Numerous experiments, extending over a series of years, have shown that, on the whole, a complete fetrtiliser, containing phosphoric acid, combined with small amounts of nitrogen and potash, is most likely to give good results. But, as a matter of fact, definite rules for the use of fertilisers on corn cannot be given.

INJURIOUS INSECTS AND FUNGOID DISEASES.

Like all other plants, maize is subject to the attacks of insect and fungoid pests. Many of the former are of minor importance. Two, however, deserve special attention. These are the Corn Worm, known in cotton-growing districts as the "Cotton Boll Worm." The eggs from which the worms are hatched are laid upon the leaves of the plant, on which the young worms of the first brood feed. The brood that works on the ears is produced from eggs laid on the silk, on which they feed when hatched. Next they attack the kernels, working their way round the ears inside the husks, sometimes eating only the outside of the kernels or boring through the under side next to the cob, so that when the husks are stripped back the worm may be half hidden in the corn. As the corn gets hard, the worms that are full-grown leave the ears and go into the ground to undergo their transformations, while others which have not reached that stage die and *rot in their burrows, where they decay,* and render the corn unfit for use. This worm is familiar to all corn

growers in Queensland, and although it does some damage to the corn crop, still it is not nearly so destructive to corn as it is to the cotton crop.

Another familiar pest here is the grain weevil. "It is," says the "Book of Corn," "the most destructive enemy to stored corn. It attacks all stored cereal products, but corn and wheat are the principal grains affected." There is no need here to detail the life history of this pest, the main point being to show how it is to be combated. A bad feature is, that it breeds for generations in barns, since the husking and threshing do not destroy the larvæ. When once established in such a place, it will remain there for an indefinite time.

STORING MAIZE.

The most efficient remedy known for its destruction is bisulphide of carbon. In order that this may be effective, the shelled grain must be stored in iron tanks.

Grain kept for any length of time in an hermetically sealed tank loses its vitality, but is good for feed purposes.

Before putting grain away in tanks or other places, it must be perfectly dry. Bisulphide of carbon at 1s. per lb. and naphthaline at 9d. per lb. are two substances used for keeping weevil and moth from grain; the former is very volatile and inflammable, and should never be used by a person when smoking or where there is a light. It has this advantage: That it leaves no trace of any odour after use and exposure of grain to the air. The odour of naphthaline is more difficult to get rid of, after it has had time to permeate grain in a tank. Bisulphide is more adapted for use with grain in closed vessels; while the naphthaline is more lasting in its effect if used in heaps of maize cobs or grain of any kind that is not in vessels.

To use the bisulphide: Procure 4 oz. for each 400-gallon tank, and place in handy bottle. Pass a piece of strong cord through the cork of the bottle, taking care that there is a knot tied to prevent it slipping out again; putty up the hole from top side after replacing the cork. Allow enough cord (about 5 ft.) to reach out of the tank. Bore a hole in a piece of wood to admit of letting the neck of the bottle into it, but not large enough to let the shoulder of the bottle through. Place the latter fixed into the wood on the bottom of the tank, and fill in the grain. Have the lid and putty ready before pulling the cork out of the bottle. Place the lid on quickly and putty up, making the tank airtight and water tight. Another method of applying bisulphide is to insert a stout length of bamboo vertically in the tank, which has previously been perforated with gimlet-holes; fill in the grain. Wind some cotton waste round a stick evenly. Pour the bisulphide on when all is ready and insert into the bamboo; then plug up the top with cotton waste, cover, and seal the tank.

For applying "naphthaline," use perforated bamboo—1 lb. for a 400-gallon tank. Insert a 4-oz. dose in the bottom of the bamboo; follow with a plug of cloth or cotton waste and continue the process, finishing off with a tight plug at the top. Heaps of maize or other grain may be treated in a similar manner; but for big heaps use a horizontal bamboo in every layer of 18 in.; but in this case bore auger-holes in the side of the bamboo at every foot. Thin bagging can be placed over the holes or around the bamboo.

Of the two processes, "naphthaline" may roughly be termed a preventive; while "bisulphide of carbon" is more of a cure, and is a sure means of destroying any weevil or moth present. To assist in retaining the vitality of the grain placed in the tanks, it is necessary to open them up periodically and move the grain about as much as possible. By testing a sample of the grain with damp flannel at each time of opening, the germinating power of the seed may be watched.

There is one possible method which an American farmer some ten years ago discovered accidentally, and which he declared to afford absolute immunity against the weevil. One year he sacked up a lot of cowpeas, and one-fourth of the sacks used were salt sacks, with the salt still clinging to them. When he marketed the peas he found those in the salt sacks were in perfect condition, whilst those in the other sacks were almost destroyed by weevil. It has been suggested that maize might be stored unhusked, but it is in the husk that a great many weevils secrete themselves and afterwards destroy quantities of the grain. This farmer, knowing this, dissolved a quart of salt in 2 gallons of water, and, as the unhusked cobs were thrown into the barn, he gave each layer a slight sprinkling of the salt solution. There was not the slightest damage from the weevil, and he has, he says, used the salt remedy ever since with perfect success. This is such a very easy remedy that Queensland farmers might take the trouble to make an experiment and find out for themselves the correctness or otherwise of the statement.

I think weevil in corn may be greatly lessened if not entirely prevented by gathering the corn with the entire husk on it, and storing in the coolest place possible, with plenty of ventilation under it—that is, the floor to be well up off the ground, say 12 or 15 in. Where the farmer has a large hayshed he might build a corn-crib inside this shed, of thick slabs and covered with boards or bark; with ventilation over the corn, I believe the trouble from weevil would be but small, if any. The Manager of the State Farm, Texas, U.S.A., says:—

"At the State Farm at Texas, where we had very cool wooden buildings, we kept corn for eighteen months without a sign of weevil. We husked and shelled the corn as sold or fed. Care should be taken that the corn is well matured and thoroughly dry before storing."

The grain may also be preserved in air-tight tanks. Before soldering or puttying the tank air-tight, a burning candle is placed in it. By combustion it will use up in a few minutes all the oxygen of the tank,

replacing it by carbonic acid gas, which is fatal to animal life. The candle will die out, and the air of the tank will be unfit for any living creature.

In the North, in the Atherton district, large quantities of corn are stored in iron tanks to protect the grain from the weevil. With reference to the effect of the destruction of the germinating power of grain exposed to the fumes of bisulphide of carbon, this will not happen if the grain is not exposed for more than thirty-six hours.

The above is absolutely the only successful method known of destroying all stored grain insect pests.

CORN SMUT.

Fig. 1.—SMUT AFFECTING THE TASSELS.

This disease is caused by a fungus known as *Ustilago zeæ*. This fungus has nothing in common with the smuts which affect wheat, oats, barley, sorghum, broom millet, &c. It attacks any part of the plant

above ground, forming large pustules, which are at first whitish or grey, and become finally black by exposure of the spores. The illustration of the smut affecting the tassels as depicted in the "Corn Book" of the Orange Judd Company is here reproduced.

Fig. 2.—TWO EARS OF SMUTTED CORN.

On the left, every kernel is destroyed, and the growth of the outer part of the ear has been checked by the disease. On the right, only the outer half of the ear is affected, the remainder having perfect kernels, unaffected by smut, and which might be planted without danger of transmitting smut to the next crop.

"When the corn plant becomes inoculated with the disease," says the authority I have quoted, "the infection does not spread to all parts of the plant, but remains local, so that each pustule represents a separate infection. The fungus does not grow upon the surface, but inside the tissues, and by the irritation it sets up, causes the tissues to swell, and

form a pustule, the size depending upon the amount of nutriment that the fungus can extract from the plant, and the rapidity with which that part of the plant is growing at the time. For these reasons the ears usually bear the largest masses of smut. . . . It was thought at one time that corn smut might be prevented by treating the seed with blue vitriol, as is done in the case of wheat seed, and it was not until the life history of the corn smut fungus was fully worked out by scientists that the uselessness of such methods for corn (maize) became apparent."

I need not here go further into the scientific description of the disease. That has little interest for the average corn-grower. His interest lies in the method of cure or destruction of the pest. Figs. 1 and 2 show the smut affecting the tassels and the lower part of the stalk.

CONTROLLING THE DISEASE.

Only two courses seem open at present for controlling or stamping out the disease. One of these is spraying with Bordeaux mixture. "But," says our authority, "this is an expensive and cumbersome method, incapable of protecting the ears from smut, because it is not wise to spray the silks when in a receptive condition, and consequently it is a method never likely to come into general use."

"The other course is to remove the source of infection by gathering the smut pustule before they break and scatter spores, and to thoroughly destroy them." But here again we are confronted with the labour problem. Only in cheap labour countries could this method prove financially profitable.

Fortunately the smut disease is not prevalent to any appreciable extent in Queensland. Here and there it may be noticed, but nowhere are the crops seriously affected by it. I only mention it that, in the event of any serious trouble occurring from the disease, farmers may adopt some means for its control.

CORN JUDGING.

There is an excellent chapter on corn-judging in an exhaustive work on corn, published by the Orange Judd Company, Chicago, U.S.A. The following is a short summary of it, which should prove useful to judges at shows in Queensland:—

The great object which the judge has in mind is to select that sample of corn for first place, which, in his estimation, is best for seed purposes—namely, which will, if planted in the ensuing spring, give the greatest profit per acre in the district in which it is grown.

THE SCORE CARD.—There are certain general points in all varieties of corn which must be taken into consideration by the judge and breeder,

and this has led to the formulation of these points in a so-called score card, as here given:—

Score Card for Corn and Explanation of Points.

	Points
1. Trueness to type or breed characteristics	10
The ten ears of the sample should possess similar or like characteristics, and should be true to the variety which they represent	
2. Shape of ear	10
The shape of the ear should conform to variety type, tapering slightly from butt to tip, but approaching the cylindrical.	
3. Colour—(*a*) Grain	5
,, (*b*) Cob	5
The colour of the grains should be true to variety and free from mixture, with the exception of a few varieties. White corn should have white cobs, yellow corn red cobs.	
4. Market condition (vitality, maturity, &c.)	10
The ears should be sound, firm, well-matured, and free from mould, rot, or insect injuries.	
5. Tips	5
The tips of the ears should not be too tapering, and should be well filled with regular, uniform kernels.	
6. Butts	5
The rows of kernels should extend in regular order over the butt, leaving a deep depression when the shank is removed. Open and swelled butts are objectionable.	
7. Kernels—(*a*) Uniformity of	10
,, (*b*) Shape of	5
The kernels should be uniform in size, shape, and colour, and true to the variety type. The kernel should be so shaped that their edges touch from tip to crown. The germ or chit and the tip portions of the kernels are the richest in protein and oil, and hence of the highest feeding value. For this reason, the germ should be large, and the tip portion should be full and plump.	
8. Length of ear	10
Northern sections, $8\frac{1}{2}$ in. to $9\frac{1}{2}$ in.; central sections, $8\frac{3}{4}$ in. to $9\frac{3}{4}$ in.; southern sections, 9 in. to 10 in.	
9. Circumference of ear	5
Northern sections, $6\frac{1}{2}$ in. to 7 in.; central sections, $6\frac{3}{4}$ in, to $7\frac{1}{4}$ in.; southern sections, 7 in. to $7\frac{1}{2}$ in.	
10. Space—(*a*) Furrow between rows	5
,, (*b*) Space between kernels at cob	5
The furrows between the rows of kernels should be small. Space between the kernels near the cob is very objectionable.	
11. Proportion of corn to cob	10
The proportion of corn to cob is determined by weight. Depth of kernel, size of the cob, and maturity affect the proportion.	
Total	100

RULES TO BE USED IN JUDGING.

1. *Length of Ear.*—The deficiency and excess in length of all ears not conforming to the standard shall be added together, and for every 2 in. thus obtained a cut of 1 point shall be made.

2. *Circumference of Ear.*—The deficiency and excess in circumference of all ears not conforming to the standard shall be added together, and for every 2 in. thus obtained a cut of 1 point shall be made. Measure the circumference at one-third from the butt to the tip of the ear.

3. *Proportion of Corn to the Cob.*—The percentage of corn should be from 86 to 87. In determining the proportion of corn to cob, weigh and shell every alternate ear in the exhibit. Weigh the cobs, and subtract from the weight of the ears, giving the weight of the corn. Divide the weight of the corn by the total weight of ears, which will give the percentage of corn. For each percentage short of standard, a cut of 1½ points shall be made.

4. In judging corn, a red cob in white corn, or a white cob in yellow corn, shall be cut at least 2 points. For one or two mixed kernels a cut of ½ point shall be made. Kernels missing from the ear shall be counted mixed. Difference in shade or colour, as light or dark red, white or cream colour, must be scored according to variety characteristics.

5. *Exposed Tips.*—Where the full diameter of the corn is exposed, a cut of 1 point shall be made, and a proportionate cut as the cob is less exposed. Regularity of the rows near the tip, and the size and shape of the kernels, must also be considered in scoring tips.

6. *Scoring Butts.*—If the kernels are uniform in size, and extend over the butt in regular order, give full marking. Small and compressed or enlarged or open butts are objectionable, as are also those with flat, smooth, short kernels, and must be cut according to the judgment of the scorer.

7. Each exhibit should consist of ten ears of corn.

Kernel Shape.—The shape of kernel varies with different varieties, but in general there are certain conditions of shape that all kernels must fill. Such kernels fit around the cob tightly, and do not leave a space at the tip, nor a deep furrow between the rows of kernels. A broad, square kernel is usually shallow, and only a few rows of kernels grow on each cob. This means a small percentage of corn to cob. On the other hand, a well-shaped kernel is usually found on an ear with a large number of rows, and results in a large percentage of corn to cob. The sides of the kernels should be straight.

TO MEASURE MAIZE IN THE CRIB OR BARN.

Two cubic feet of dry corn on the cob will make 1 bushel of shelled grain. One cubic yard will give 4½ bushels of grain. A crib to hold 800 bushels of shelled corn must have the following dimensions:—20 ft. long, 10 ft. broad, 8 ft. high. The volume of such a crib is $20 \times 10 \times 8 =$ 1,600 cubic ft. Divide by 2 and you have 800, or the number of bushels of shelled grain.

A HAND MAIZE PLANTER.

A farmer at Seaview Hill, Bondoola, near Rockhampton, invented a simple implement for planting maize in unstumped scrub land, by

means of which the grain may be planted when the surface soil is so dry that planting in the ordinary way with the hoe is impracticable, or, at least, unadvisable. It operates very much in the same way as a hand potato-planter.

No. 2 is a $\frac{3}{4}$-in. bar of iron over 6 ft. long, tapered for $2\frac{1}{2}$ in. at one end, which must carry full size to start of taper. Eleven inches from the point, a $\frac{1}{2}$-in. $3\frac{1}{2}$ in. long tread is firmly riveted through the bar, as shown. No. 1 is a tube made of stout galvanised sheet iron. The bottom piece, 7 in. long, made of No. 20 galvanised iron if obtainable, is turned to just fit the $\frac{3}{4}$-in. bar. The other portion is made in the shape shown, with a funnel top. The joints must be very strongly made, with also a stay flush with top of the 7-in. piece, and another guide strap about 5 in. from the bottom of the funnel. The $\frac{3}{4}$-in. bar is slipped up through it, and the strain is thus lessened. The bar is shown in position in No. 1 by the dotted lines.

The planter, with bag at waist, grips the bar at a comfortable height with his right hand—if he is a right-handed man or *vice versâ,* if not—and takes hold of the tube immediately below the funnel with his left. He then lifts the tool as high as he can, taking care to keep the sheath tight up to the tread with his left hand; and he then drives the point into the ground in front of him, using only his right hand in the downward stroke. If not sufficiently deep, he may push it deeper with his foot on the tread. While on the downward stroke he lets go the sheath and, by the time the tool is down, has three grains of seed ready to drop into the funnel; this seed goes down the tube till it can get no further, being stopped by the bar. This is only for a second, for when the bar is lifted 6 in. the seed runs down the tube or sheath into the ground. The bar is not let down again, but the sheath is drawn up the bar till it strikes the under side of the tread, and both are lifted again for the next stroke. It is not necessary to cover the grain; sufficient earth will fall in to do that—in fact, it is best without covering. The farmer who sends me this note on the maize-planter says: "I am in my sixtieth year, and I can plant nearly an acre a day and not bend my back. I have planted in the uncultivated scrub soil between the stumps and logs, at a depth of 8 in., putting the seed down where the moisture was, and every stool grew. This was at a time when my neighbours could not plant for want of moisture. Wherever there is any hand-planting to be done, this instrument will be found useful, only using guide poles, and drills are not needed. I have not patented the device, and am prepared to manufacture them for anyone who wishes to make a trial of them."

WHEN TO SOW MAIZE.

With such a wide diversity in climate as we have in Queensland, no rule can be laid down which will apply to all districts. In the Far North, on the coast there is very little variation of climate except during the months of June, July, and August, by courtesy called winter months in the tropics. Here there are no frosts to fear, and planting may be

done during a longer season than in the South, but the usual planting seasons are from September to January. A few miles inland from Cardwell, Cairns, and other parts of the coast, there is a marked difference in the climate, owing to the elevation above sea-level. On the tableland there occur frosts in winter, and, generally, the climate assimilates itself so closely to that of the Southern and Central districts that the maize-planting season is very much the same—namely, from August to January. As a matter of fact, in the South there are three planting seasons, for the early, middle, and late crops. In some districts a middle sowing is not much favoured, in others good results follow. It has happened that in the South, on the coast, sowings of 90-day corn in April have escaped frost and good crops have resulted. As a general rule, in the South, the planting season for maize extends from late August to December.

THE AMOUNT OF SEED REQUIRED.

may be set down approximately at from ½ bushel if drilled or hand sown, and 1½ bushels broadcast for fodder or ensilage. Mr. G. B. Brookes, Instructor in Agriculture, Department of Agriculture and Stock, puts the amount of seed required per acre at from 8 to 10 lb.

MORE ABOUT RHODES GRASS.

By G. B. BROOKS, Instructor in Agriculture.

Rhodes grass is so well known in many districts that the giving of information relative to its propagation would be practically superfluous. There are localities, however, where this valuable grass has not yet secured a footing, and from these, frequent inquiries are made regarding its introduction.

For a number of years, *Paspalum dilatatum* was looked upon, more especially in our coastal areas, as being the best of all introduced grasses. At the present time, it is very hard to find an advocate for it, the more recently introduced Rhodes being considered a much superior grass.

The superiority of Rhodes over Paspalum lies mainly in its being less particular in regard to soil, its possessing a much higher feeding value, and last, but not least, its powers of drought-resistance.

When Rhodes was first introduced, it was looked upon as being entirely useless as a winter grass, owing to its susceptibility to low temperatures, and this conception was undoubtedly the chief cause of keeping it from coming into more rapid use.

Having now been under observation for a number of years, and subjected to varying conditions of soil and climate, it has been found to readily adapt itself to its surroundings. It grows in moist, warm, low-lying coastal situations; it will, when a sudden drop to freezing-point occurs, get cut down to some extent; but on the other hand, when

raised under more hardy climatic conditions, such as in our Western scrubs, it will often withstand low temperatures without being in any way seriously affected. During the past winter, the writer saw large areas on the Downs looking quite fresh and green, after having experienced both a long spell of dry weather and a succession of fairly heavy frosts, while adjacent Paspalum paddocks were quite brown and dry.

The laying down of scrub land with Rhodes grass is a comparatively simple matter, the only requisites being sufficient timber to make a clean sweep when fired, and that the planting be carried out during the moist, warm months. Many failures have resulted from planting either too early or too late in the season. The safest period may be set down as from November to February. In coastal situations, where a longer wet season is generally experienced, the period for sowing could with safety be considerably extended. After burning off, the seed is simply broadcasted amongst the ashes.

To establish a good stand of Rhodes in forest land or timbered country is generally a more difficult proposition, more especially in dry districts, or where the soil is of a heavy stiff nature. Broadcasting the seed amongst the natural grasses, more especially when stock are running, generally results in complete failure. What few plants may take root are eaten out before they can obtain a firm hold of the soil—in fact, in both scrub and forest, it is decidedly advantageous to keep the stock off during the early stages of growth.

In putting heavily timbered country under Rhodes, the first essential is to ringbark. The next operation is to loosen the surface soil so that the seed will have a good chance of germinating and taking root. This surface stirring can be accomplished in most situations by means of a spring-tooth harrow or disc cultivator. The number of cultivations necessary to secure a seed bed will depend largely upon the texture of the soil, and the variety of indigenous grass growing thereon. When more than one cultivation is given, crossing should be resorted to.

Ploughing to a shallow depth is very effective, but is a good deal more costly than by using the cultivator.

Two pounds of average quality seed is sufficient to sow an acre, both in scrub and forest. Given seed of good quality, half that amount would be ample (see article in May *Journal*). After sowing, the land should be gone over with a brush harrow, or roller. When the soil is likely to cake after rain, the latter is preferable.

There is not the slightest doubt that Rhodes grass is proving itself eminently suitable to a very wide range of Queensland climate. The only doubtful point is its permanency. So far, however, I have not met with any instance of its tendency to die out. Given favourable seasons, the area that will be put under Rhodes grass, even during the next two years, will be very considerable. This applies not only to coastal country, but to our Western scrub lands, where this grass thrives most luxuriantly.

INFORMATION FOR INTENDING TOBACCO GROWERS.

For the Information of those Desiring to try the Experiment of Tobacco Growing.

Because tobacco is growing wild about the country, it is no evidence that it can be cultivated profitably in any district, as tobacco will grow anywhere, but not always of a good quality. It requires a friable and not too heavy soil, a fairly humid climate, though the rainfall may not be heavy. Pipe tobacco should be grown on the high country above the Range, inland, and cigar tobaccos on the coastal country. Seed can be supplied by the Department of Agriculture and Stock at 1s. 6d. per oz. for pipe, and 2s. 6d. per oz. for cigar.

Pamphlets on tobacco growing will be forwarded on application. The time for sowing seed beds is from August to December, and the time for transplanting into the field is from 1st October to 1st February in Southern Queensland, and from 1st October to 25th February in Northern Queensland.

It should be remembered that good tobacco will not grow everywhere, and for the information of intending growers I would suggest that only a small experimental plot be tried at first, and samples of the cured product submitted to manufacturers before going in largely. Good tobacco of both varieties is in demand at good prices.

R. S. NEVILL, Tobacco Expert.

THE QUEENSLAND AGRICULTURAL COLLEGE MAGAZINE.

We have received the first number of the above publication, and congratulate the College authorities on the institution of a journal which cannot fail to be of great value and interest to all who are and have been connected with the College, either as officials or students. It will also be of much service in affording the general public an insight into the working of the only Agricultural College in Queensland. As stated at a meeting of officers and students, held in the Assembly Hall, when it was decided to issue a magazine, it should be remembered that "the historical traditions of this institution are not writ in letters blazoned with gold; its records are lost in oblivion." This is much to be regretted, as the history of the College, recounting its triumphs and its failures, and handing down to posterity the honoured names of its principals, from Professor Shelton to date, and also those of the old-time officials and students, would be of very great interest to future generations. The magazine is well illustrated, and contains many articles of value to farmers, particularly one by the Acting Principal, Mr. H. C. Quodling, on "stock ensilage." Mr. A. E. Gibson, Farm Foreman, in a short article, strikes a note on afforestation which coincides happily with the warning published by the Director of Forests as to the depletion of our timber supplies. Other articles on dairy breeds of cattle are well worthy of study. The magazine also devotes considerable space to successes at various shows, to engineering, carpentering, and other trades in which the students are instructed, to recreations, cricket and football matches. Taken altogether, the publication reflects great credit on its editor and contributors. The magazine will, it is stated, be issued twice annually.

PLATE 39.—EFFECT OF A STORM AT THE QUEENSLAND AGRICULTURAL COLLEGE—ONE OF THE DORMITORIES.

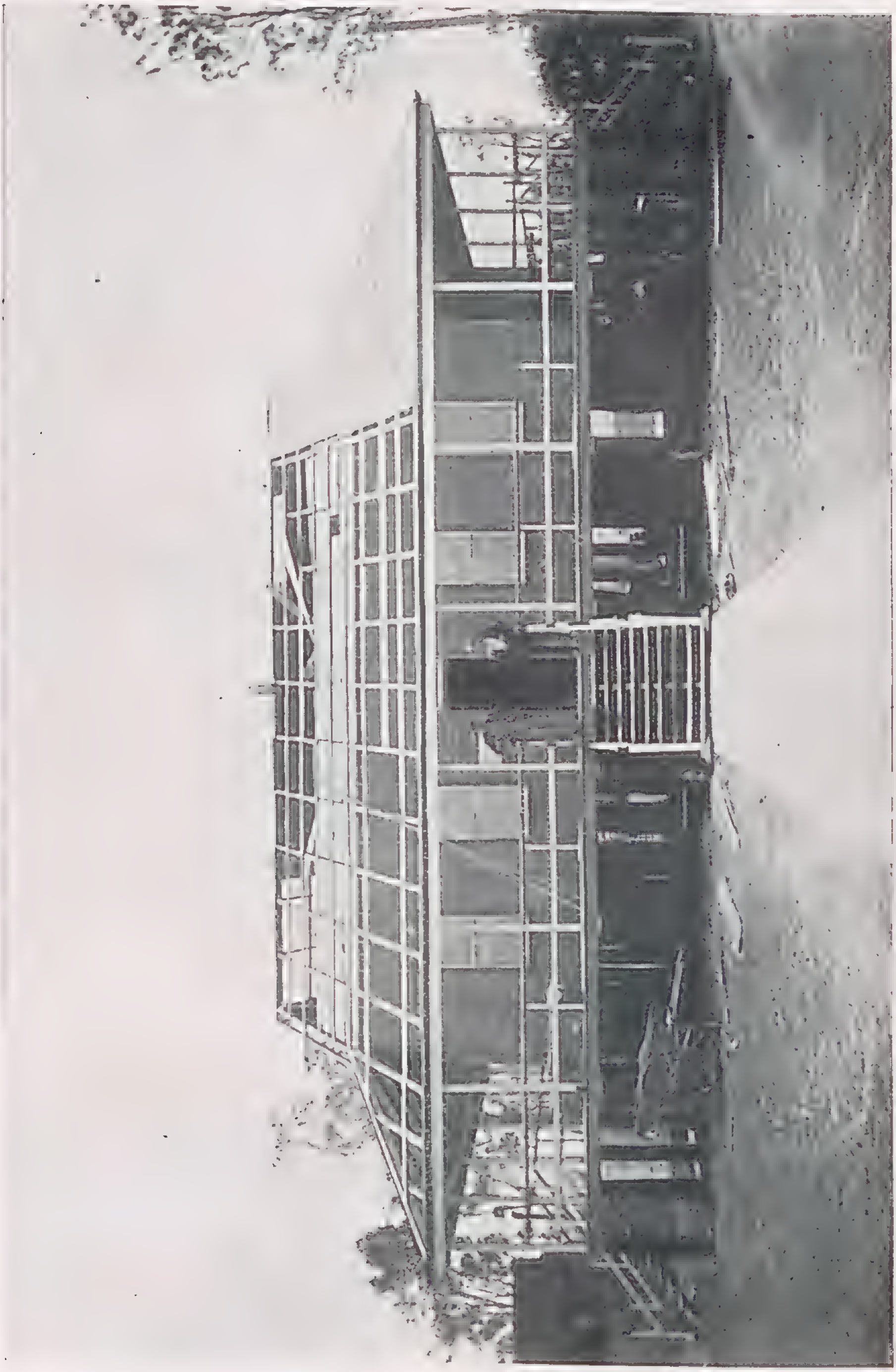


Plate 40.—Effect of a Storm at the Queensland Agricultural College—The Dining Hall.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RECORD OF COWS FOR MONTH OF SEPTEMBER, 1912.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Rosalie ...	Ayrshire	15 Aug., 1912	1,205	4·1	55·27	
Glen ...	Shorthorn... ...	5 Sept. ,,	890	4·9	49·21	
Lady Lock...	Ayrshire	10 July ,,	1,041	4·1	47·75	
Reamy ...	,, ...	9 Aug. ,,	1,051	4·0	46·97	
Auntie ...	,, ...	4 July ,,	1,048	4·0	46·89	
Lady May ...	,, ...	19 July ,,	617	5·9	42·75	
Rosebud ...	,, ...	24 June ,,	884	4·2	41·49	
Lady Margaret	,, ...	4 May ,,	743	4·7	39·32	
Miss Edition	Jersey	13 Aug. ,,	857	4·0	38·31	
Bluebelle ...	,, ...	2 Aug. ,,	756	3·9	32·90	
Burton's Lady	Shorthorn... ..	1 June ,,	599	4·2	28·19	
Bliss ...	Jersey	22 Aug. ,,	642	3·9	20·93	
Lerida ...	Ayrshire	4 Mar. ,,	602	4·0	26·90	
Gem ...	Shorthorn... ...	29 April ,,	619	3·6	24·76	
Lady Morton	,, ...	9 Feb. ,,	531	4·0	23·73	
Nellie II. ...	,, ...	1 Feb. ,,	597	3·3	21·78	
Laura ...	Ayrshire	6 Mar. ,,	543	3·6	21·72	
Dewdrop ...	Holstein	3 Nov., 1910	472	4·0	21·08	
Duchess Fanny	Shorthorn... ...	24 Aug., 1911	379	4·9	20·95	
Miss Heydon	,, ...	21 Mar., 1912	553	3·3	20·15	
Mist ...	Holstein	20 Oct., 1911	552	3·3	20·12	

KIND TREATMENT OF COWS.

An interesting experiment was recently performed at the Kansas Agricultural College to determine the relative results of kind and unkind treatment upon cows. Three cows were treated kindly, and were found to give an average of 36 lb. of milk, with 4.3 per cent. of butter fat. Later, these same cows were frightened by jumping at them, howling at them, and striking them while they were eating. It was found at milking that they produced only 23 lb. of milk, containing 3.4 per cent. of butter-fat. Three other cows tested 31 lb. of milk, containing 4.2 per cent. of butter-fat, under kind treatment. They were driven into a field, and the dogs were allowed to bark at them and chase them. As a result they averaged only 23 lb. of milk, with 3.6 per cent. of butter-fat. It should not be necessary to point the moral.—" Exchange."

ADVICE ON THE ROUTINE OF THE DAIRY.

By E. GRAHAM, Dairy Expert.

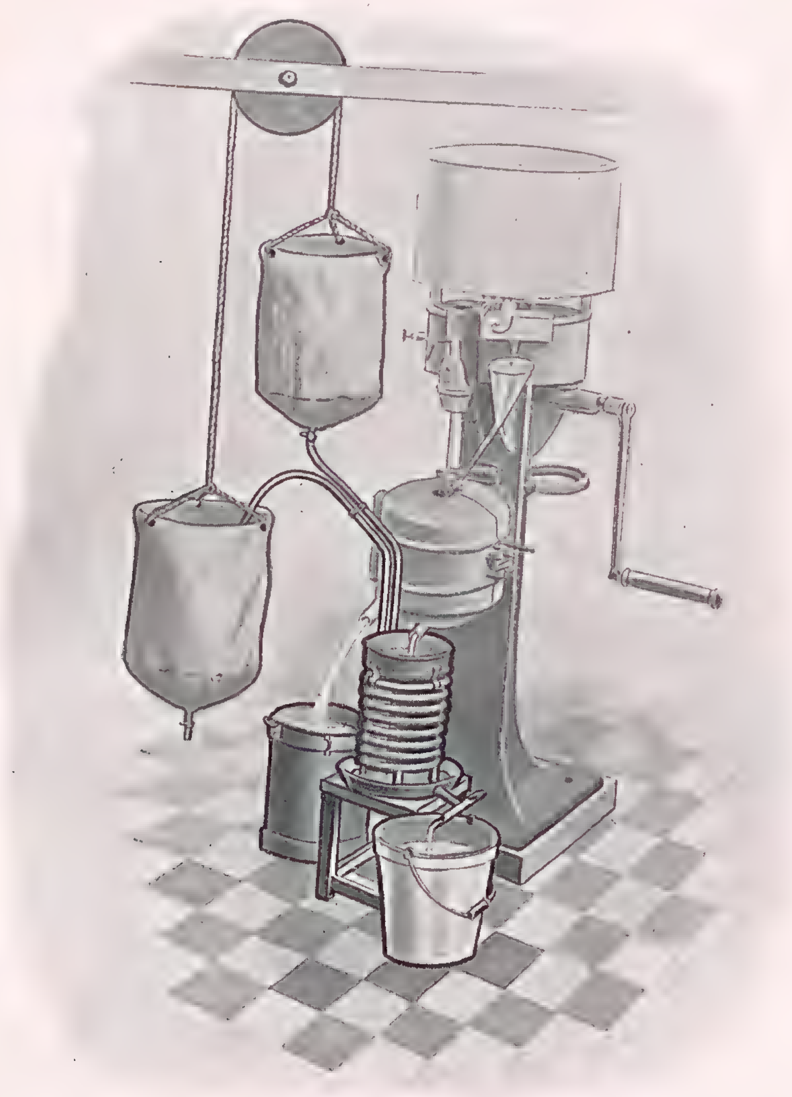
[CONTINUED FROM OCTOBER ISSUE.]

The richness of cream obtained from the separator may be regulated by a device called the "cream screw." While many other factors may affect a test of the cream, the cream screw is dependable upon for securing either a rich or a thin cream. The cream screw should not be changed unless the cream test shows either too high or too low a reading. The legal standard for cream requires that the cream must contain not less than 35 per cent. of butter fat obtainable by the Babcock test. The percentage of butter fat specified is given as a minimum, and the ideal percentages of butter fat can only be ascertained by a study of the various localities, season, and general conditions under which the supply is raised. For the guidance of dairymen desirous of supplying cream of a high grade, it is recommended that during the warm season of the year the milk be so separated as to yield a cream containing from 38 to 44 per cent. of butter fat, while lower percentages are permissible throughout the cooler period of the year: particularly does this matter apply to dairymen resident in the colder parts of the State. The existing belief, shared by dairymen, that it is more remunerative to supply to factories a low, than a moderately high testing cream, has nothing to support it in quarters where testing is carefully and honestly carried out, while the fallacy of paying unnecessary freight and cartage on the increased bulk of the cream, due to its low test and the consequent daily encroachment on the skim milk supply, which is so valuable on the farm, should be sufficient reason for dairymen to arrest the leakage to the industry accruing from the methods of supplying low-test creams, which are now in too common practice.

The richness of the milk separated affects the butter fat contents, but not the quality of the cream, and practically the same volume of cream is obtained, irrespective of whether the milk has a high or low butter fat content. The amount of fat lost in the skim milk is not affected to any appreciable extent by the richness of the milk separated.

It is evident that any variation, from time to time, in the quantity of water or skim milk used in the flushing of the bowl at the completion of the separating process, will have a marked effect upon the test of the cream. A variation of one pint in the amount of flushing fluid used may change the test of the cream several per cent., depending upon the amount of cream obtained. The manner in which the flushing is done has a marked influence upon the texture and keeping qualities of the cream. If the skim milk for flushing is added at a greater rate than the capacity of the separator can cope with, much of the non-fatty solids it contains are carried through the cream outlet and become mixed with the cream supply. It is generally recognised that the non-fatty solids are the poor-keeping constituents of cream, consequently their presence in cream is to be limited as far as possible. It was upon the knowledge of this principle that the 35 per cent. butter fat standard for cream was based. No doubt more full attention to the

general management of the separator, and the method of flushing the bowl in particular, would do much towards removing many low-test cream suppliers' names from the lists at the butter factories.



TREATMENT OF CREAM SUPPLY.

Proper facilities for handling cream to best advantage should be at the command of every dairyman. In a comparatively warm climate, such as that of Queensland, every dairy should be fitted with an aerating and cooling appliance. For the purpose of cooling and aeration of the cream, an appliance similar to that here illustrated is probably the most convenient for use. As shown in the illustration, the supply of cold water is obtained from water bags, and the cream is caught from the separator spout and run over the cooler and aerator,

from which it is discharged into an open-topped or enamel bucket. The cooling appliance is so constructed as to render it an easy matter to recool the cream later, should the temperature show an inclination to rise. The structure of the cooling appliance is such as will allow of its immersion in the cream contained in any ordinary-sized cream can that has an open top. The water taps may then be opened into the cooler and a circulation of cold water put through the cooler while it is stationed in the cream. The vessels in which the milk or cream is contained should be particularly well cleansed. Even when cans are carefully washed at the factories and thoroughly aired, it is possible, when these cans are unlidded at the farm, that they may give off a foul smell. It is always safe to give the returned cream cans another washing and time to thoroughly air before filling them with milk or cream. On many farms where cream is produced, it is necessary to hold it some time before delivering to the factory, and a serious application of the principle of aeration and cooling here outlined will materially improve the quality of the resultant butter. With cream, as well as milk, the fresh warm portion should never be added to that already cooled until it has been reduced to the same temperature. The room in which milk or cream is held and cooled should be used exclusively for the storage and treatment of those products, as both are of such a delicate nature and so highly susceptible to taints and contamination. The proper care and handling of milk or cream is exacting work, and should not be entrusted to a careless or ignorant person for performance. There is no point in the life of milk or cream where a reasonable amount of mature experience and judgment will not amply pay for their application. Milk and cream are so readily perishable that only trained persons should be trusted with their care, and the cost of producing them makes carelessness a dangerous and expensive risk to take. Probably no form of human food is produced under conditions where skill and common sense count for more than in the production and handling of milk and cream. There are instances where children of tender years, and other incompetent persons, have been employed to carry out most of the important work of the dairy. It is hard to imagine any arrangement calculated to produce disaster more vicious than one of this kind. This exactness applies not only to milk and cream, but to the production of all forms of dairy products.

It is maintained that a large percentage of the cream delivered at factories is so handled that the quality of the butter made therefrom is injured. The producer should have some interest in the delivery of his products, especially if he has given it good care up to this point on the farm, and is sending it to a factory where quality is recognised and paid for. It is desirable that the time from the cow to the churn should be as short and the conditions as favourable as possible. It is remarkable how much may be accomplished in the way of delivering cream of good quality, if it is first thoroughly cooled, aerated, and cared for on the farm, and despatched in well-covered and well-insulated vans. Why so little interest is taken in this important phase of dairy work is almost beyond comprehension.

It is not wise when the supply of cream is low, or even under any circumstances, to withhold the cream on the farm for four or five days in order to get a full can. To obviate the difficulty of churning, which is apt to take place in the partially filled cans, it is best to use a can of smaller size than ordinarily, and send the cream to the factory more frequently. Greater care in the production and handling of the cream on the farm and is sending it to a factory where quality is recognised assuredly do much towards improvement in the quality of our butter, and the power to remedy and overcome defects due to the causes mentioned rests almost solely in the hands of those concerned with the different steps of the business. It is not that more knowledge is needed but that a better application should be made of the facts already understood. The cream producer or factory operator who overlooks his responsibility in this regard is not serving the best interests of the industry.

Statistics.

COMMONWEALTH METEOROLOGY.

RAINFALL OF QUEENSLAND.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1911.				1912.								
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.
North.													
Ayr	...	...	...	...	...	...	3·53	1·16	1·01	6·70	...	...	Nil
Bowen	Nil	1·5	0·19	1·32	1·56	3·15	1 86	0·59	1·76	3·78	...	0·18	Nil
Cairns	0 6	0·88	1·95	0·90	4·81	16·68	5·95	4·71	5·97	8·00	...	2·89	0·75
Geraldton (Innisfail)...	0·30	0·73	1·61	0·75	5·50	18·24	6·01	56·14	41·84	15·25	..	3·39	2·65
Gindie State Farm ...	...	0·81	...	3.50	0·68	2·59	1·88	0·63	...	9·94	3·45	...	Nil
Herberton	Nil	0·9	0·62	5·36	5·29	2·82	1·47	1·40	2·20	2·36	...	1·30	0·53
Hughenden	Nil	Nil	1·37	0·69	5·78	1·84	3·52	Nil.	0·74	6 64	...	Nil	0·13
Kamerunga State Nurs.	...	...	...	...	...	...	...	*	...	...	...	...	...
Mackay	0·3	0·93	0·17	0·41	2·08	8·04	·93	3·56	3·42	5·51	...	0·23	0·2
Mossman	0·09	0·55	0·86	3 31	6·06	18·32	17·60	6·40	2·78	8·88	1·33	1·98	1·80
Rockhampton	Nil	0·40	0·6	0·81	2·50	3·24	·14	0·01	1·98	8·38	...	Nil	Nil
Townsville	Nil	0·39	0·31	2·84	1·64	7·57	6·35	4·51	0·63	4·49	...	0·17	Nil
South.													
Biggenden State Farm	...	...	...	...	...	...	...	...	...	...	...	...	...
Brisbane	0·84	4·95	0·84	1·94	1·85	2·13	1·03	0·72	0·20	7·22	...	1·32	0·43
Bundaberg	Nil	2·36	1·30	2·98	3·96	2·47	...	Nil.	1·33	10·23	1·76	0·78	0·22
Bungeworgorai (Roma State Farm)	...	...	...	...	0·73	...	2·19	N .	...	7·06	...	0·33	0·22
Crohamhurst	0·51	6·27	1·74	3·02	5·62	8·72	13·73	1·77	1·39	9·99	1·67	...	...
Dalby	0·42	3·45	1·99	1·55	1·76	2·58	·53	Nil.	Nil	4·76	...	0·68	0·87
Esk	2·04	4·17	0·47	0 44	1·38	8·26	·22	0·36	0·11	7·43	...	1·13	0·52
Gatton Agric. College	0·96	3 77	0·49	1·90	3·56	3·31	7·86	1·35	...	6 63	1·84	1·04	0·53
Glasshouse Mountains	0·60	4·58	1·76	1·44	3·37	6·99	13·15	0·31	0·98	7 85	1·86	1·14	0·8
Gympie	0·26	2·42	0·50	2·10	2·92	4·47	·15	0·37	0·52	2 63	...	0·92	Nil
Ipswich	0·34	4·71	0·25	...	1·87	3·00	·41	0·30	Nil	3·93	...	1·02	0·49
Maryborough	0·9	2·81	0·90	4·98	2·39	3·93	·11	0·32	1·09	9·12	...	1·26	Nil
Roma	0·87	1·9	1·55	1·19	0·74	0 76	·85	0·03	Nil	7·96	...	0·77	0·28
Tewantin	0·4	7·48	1·14	2·13	5·60	4·25	·85	0·80	8·46	8·72	...	0·82	Nil
Toowoomba	...	...	...	...	...	...	·52	0·66	0·16	6·75	...	1·05	1·08
Warren State Farm ...	...	0·64	...	...	0 82	1·75	2·04	0·22	1·28	9 51	3·35	...	...
Warwick	0·80	1·78	2·26	0·70	1·57	3·45	·56	0·02	0·9	5·69	...	1·37	1·50
Warwick, Hermitage State Farm ...	...	0·60	...	...	...	...	...	...	...	...	...	...	...
Westbrook State Farm	...	...	...	...	...	...	...	Nil	...	...	...	...	...
Woodford	...	...	...	...	...	...	...	...	...	9·78	...	...	0·53
Yandina	0·30	2·90	1·36	1·87	5·95	4·84	·95	0·88	1·39	7·42	...	1·25	0·18

NOTE.—The rainfall data in this table are compiled from telegraphic reports, and must be considered as approximate only. * No Report.

GEORGE G. BOND, Divisional Officer.

Poultry.

REPORT ON EGG LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, SEPTEMBER, 1912.

Four thousand two hundred and sixty-nine eggs were laid during the month—an average of 142 per pen. The Black Orpingtons owned by Mr. R. Burns again win the monthly prize with 163 eggs. The following are the individual records:—

Competitors.	Breed.	Sept.	Total.
R. Burns	Black Orpingtons ...	163	721
J. Gosley	White Leghorns ...	139	688
T. Fanning	Do.	155	678
A. T. Coomber	Do.	141	665
Range Poultry Farm	Do. (No. 1)	141	648
A. R. Wooley	Do.	135	647
E. A. Smith	Do. (No. 2)	147	643
H. Tappenden	Do.	145	630
J. R. Wilson	Do.	147	601
Yangarella Poultry Farm	Do.	152	598
W. D. Bradburne, N.S.W.	Do.	148	591
E. A. Smith	Do. (No. 1)	132	587
R. Burns	S.L. Wyandottes ...	141	586
Mrs. Beiber	Brown Leghorns ...	142	586
Cowan Bros., N.S.W.	White Leghorns ...	145	563
J. Zahl	Do. (No. 1)	138	535
B. Holtorf	Do.	139	525
Mrs. Sprengel	Do.	144	519
J. Holmes	Do.	131	479
Range Poultry Farm	Do. (No. 2)	144	478
H. Hammill, N.S.W.	Do.	136	476
A. H. Padman, S.A.	Do.	160	469
J. Zahl	Do. (No. 2)	137	467
W. W. Hay	Black Leghorns ...	140	436
Mrs. Dredge	White Leghorns ...	125	435
D. Grant	Do.	150	433
J. F. Dalrymple, N.S.W.	Do.	112	413
F. G. Cornish	Do.	154	406
R. Burns	Do.	137	381
Mrs. Craig	Do.	149	358
Totals	...	4,269	16,212

State Farms.

RAPE.

By R. SOUTTER, Manager, Bungeworgorai State Farm, Roma.

This crop, which has been grown in the rotation experiments at this farm, has proved itself to be extremely hardy, and can be relied upon to provide fodder under circumstances unfavourable to most other crops, and at a time when, even in good seasons, there is a shortage of green feed. So marked have been the results here that, notwithstanding the short period it has been tried, the sowing of it is advocated without any fear as to the result, providing the ground has been properly prepared for the reception of the seed, which must be sown at a seasonable time. The plant belongs to a temperate clime, being a native of Great Britain. For this reason, it has to be grown as a winter crop in Queensland. This feature, in conjunction with the quick return it gives, should result in it being more extensively grown in portions of this State in the very near future, more especially in those parts where sheep-raising and wheat-growing are being combined, or where wheat lands require renovating.

For green-manuring purposes, it is one of the most suitable crops to grow, for the reason that a large quantity of material, which decomposes quickly when turned into the soil, is obtained in a minimum space of time. Not only does the growing of this crop for green-manuring benefit the soil, but its root-system is such as to exert a most beneficial effect on the subsoil by admitting air and water as it decomposes. This deep-rooting feature is the one necessary in all plants to prove suitable for dry climates, being the one which enables them to successfully withstand the protracted dry spells often experienced.

As a fodder, it is either grazed off or cut and fed to stock, the former being the most suitable, as the labour of cutting and carting is saved, and the ground is enriched by the excreta of the animals depastured thereon.

Cutting and feeding is necessary when heavy stock, such as horses and cattle, are to be fed with the first crop, and a second growth is hoped to be obtained. Care must be exercised in turning stock of any description on it to graze, as they are liable to get blown in the same manner as they do on lucerne, &c., until they become used to it. In any case, it is better to keep hungry stock off it, unless they can be turned off shortly after being put on, and it is also wise to refrain from utilising it for grazing purposes during wet weather, or in the early morning, whilst the dew is on it.

Rape, like many other crops, gives a taint to the milk of cows depastured on it; and for this reason, it should be cut and fed to the dairy herd immediately after milking.

As with the cabbage, so rape prefers rich soil to grow in; but, like wheat, will grow in nearly any class of soil, and, fortunately so, for it is on the poorer classes of land that its services as a soil-improver or renovator are mostly availed of. At this farm it has been grown successfully on stiff clayey soil and nearly raw sand. In order to get the maximum results from sowing on light soils, the following mixed fertiliser is recommended by Mr. Brünnich for application to each acre sown, viz.:—

2 cwt. superphosphate;
1 cwt. sulphate of potash;
1½ cwt. nitrolim or sulphate of ammonia.

In sowing here, it has been the practice, up to the present, to mix the seed with the fertiliser, and drill in from the fertilising box.

Experiments conducted in one of the Southern States demonstrated that a certain moisture percentage in the soil (below that sufficient to promote germination) destroyed the vitality of 50 per cent. of the seed sown with fertiliser in twenty-four hours. Such being the case, the practice will be discontinued, and the seed drilled in with sand, and the fertiliser applied as it is done with corn—the superphosphate and potash down the tube on one side, and the nitrolim down the one on the other side of that which conducts the seed to the ground.

So far, from results, it is judged that sowings may be made as early as the end of February, and continued until the end of June. With the advent of summer, the cabbage-moth and aphis appear, and quickly render the crop worthless for fodder purposes. This fact precludes it from being sown any later in ordinary seasons, excepting, probably, in a few favoured situations. It has been found here that, though the seed can be put in on the lighter soils when the ground is dry, or immediately after rain, with the same results, on the clayey soils it is better to sow immediately after rain, as then the crust which prevents so many of the young and tender plants from coming through is destroyed by the drill passing over it, and ideal conditions for germination and young plants substituted.

Though the crop may be sown broadcast, such is not recommended. It has been the practice here to sow in drills 3 ft. to 3 ft. 6 in. apart, at the rate of 1¼ lb. and 1 lb. of seed respectively per acre. Put in in this manner, the prospects of securing a crop are greatly increased through facility for cultivation, which permits of the conservation of moisture in the soil, whilst at the same time it results in the cleansing of the ground of weeds.

Last year (1911), though the rainfall from April to the middle of October was under 4 in., this crop and swede turnips provided the bulk of the green food of the pigs, cows, &c., from the middle of May to the end of August. This year (1912), though more rain has been recorded than during the period mentioned in 1911, the conditions have been much more unfavourable through absence of moisture in the subsoil; nevertheless, the rape and turnip crops have met the requirements which they were sown for.

The only variety tested, which, from records, apparently is the most suitable for our conditions, has been Dwarf Essex. The reason that it is thought to be most suitable is, that it appears to be hardier, earlier, and less injured by grazing.

OATS IN CENTRAL QUEENSLAND.

By T. JONES, Manager, State Farm, Warren.

I have been living five years in Central Queensland, and have taken keen notice of all the crops in the district each year, and yet I have not seen a good crop of oats anywhere in the district during that period.

Oats require more rain and a lower temperature than wheat, barley, or rye, and, consequently, must be of less value than those crops for our locality.

I have not seen many varieties tried here, but have seen sufficient to prove that the white varieties are invariably affected by rust, and that the darker varieties seldom come to maturity, owing to our dry climatic conditions. The flag becomes brown and withered, and does not produce even a fair head of grain. This makes it impossible to produce a good clean sample of oaten chaff.

At the Warren State Farm, I have grown a little each year, but have not yet produced a good crop. This year, it could be seen planted near wheat and Canary grass. Both the latter are thriving, and producing good crops; while the oats, under exactly the same conditions, were withering away for the want of moisture, and consequently, had to be harvested at an immature stage.

I do not think it is necessary for me to give full particulars regarding the varieties tried here. I think it is sufficient to state that all the varieties have been comparative failure, and very much so when compared with such crops as Canary grass, Cretan, Emmer, Bald Medeah, and Kubanka wheats. The latter-named crops are always free from rust, and produce good crops when oats are a complete failure. When we look for the reason of this, we must think where the crop flourishes best—viz., Scotland, the North of Ireland, &c.: countries in which there is plenty of moisture and an even summer temperature.

What can be more unlike these conditions than the weather we experience here from June to October? No rain, and in the two latter months, great heat.

Is it any wonder that oats, as a crop, are a failure in Central Queensland? I would like to see the farmers abandoning the growing of oats as their chief cereal, for the crops that I have proved to be successful.

TROPICAL FRUITS.

By C. E. WOOD, Manager Kamerunga State Nursery.

Of the many tropical fruits few can surpass a good mango, but it must be acknowledged that the fruit of most of the fine large trees growing in the district are not equal to what might be produced, as in most cases the fruits contain a large amount of fibre and large seed, so that it is hardly to be wondered at that mangoes when sent South are not much sought after. Amongst varieties at the Kamerunga Nursery, Badaya seedling and Malda seedling (both of which bore a few fruit last season) appear to be especially good, being very free of fibre and of fine flavour. Other trees coming on—Alphonso, Rosebud, and Brindabium—are expected to be of good quality, as these latter are grafted trees.

Some three months ago twenty-four seed of the Carabao mango, from the Philippines, were received. Of these twelve appeared fit for planting, the other twelve being dead; of the twelve planted seven came up, but one has since died. This is said to be a mango of high quality, and one that reproduces itself true to seed. It should be an acquisition to the district if the young seedlings continue to thrive.

Another fruit that should be more generally grown is the *Anona Cherimolia*. Unfortunately, this tree has not succeeded in the low lands on the coast in this district, but up on the tableland it should do well, and the fruit should find a ready market locally, as it is greatly superior to *Anona reticulata* (the Bullock's-heart custard apple) or even *A. squamosa* (the Sweet Sop).

When in Brisbane lately I noticed individual fruits of the Cherimoya type were selling at 1s. each, and I heard of some especially fine ones fetching as high as 3s. As the Cherimoya has not yet fruited to my knowledge at Kamerunga, no plants are available, but seed, or better still, grafted plants, could most probably be procured from Brisbane, but an Anona which appears to be a hybrid flowered well last season, but set no fruit until late in the season, when it bore four fruit. In appearance the fruit was of the Cherimoya type, juicy and of excellent flavour, but the leaves of the tree are very similar to those of the Sweet Sop. Should this tree prove hardy and turn out a good bearer it would take the place of the true Cherimoya on the low-lying lands.

GINDIE STATE FARM.

The manager, writing under date 15th October, reports:—

We are busy getting in our hay crop. Up to the present the weather has been favourable for this work.

Considering the dry weather that we have experienced during the last three months, the crop generally is better than could have been expected. In fact, some portions could not have been better under the most favourable weather conditions.

I will endeavour to give a detailed report of this work in the next issue of the Journal.

The Orchard.

FLOWERS OF THE PAPAYA.

It is well known in the West Indies that, although the male and female flowers of the papaya tree are usually produced on separate trees, flowers possessing both characteristics (hermaphrodite flowers) and arising in female inflorescences, are often found, and that it is also possible to cause a "male" tree to bear female flowers and ultimately fruits, by cutting it back.

L'Agriculture Pratique des Pays Chauds for October, 1911, gives attention to an exceptional case, where hermaphrodite flowers arose in a male infloresence, in a note which describes a plant in the Jardin Colonial in Upper Guinea, near Kindia. This plant had already borne male flowers, without fruiting, when suddenly at its full flowering time, it produced long axiliary inflorescences containing gamopetalous flowers with normally developed stamens and a rudimentary ovary. At the time of reporting, three fruits had appeared, each about 4 in. long, and soon after a young fruit about half as large. One of the fruits was plucked, and was found to contain numerous normal ovules. It was not expected, however, that these would attain a true maturity, as their stalks were exhibiting a yellowish tint which indicated premature ripening.

In presenting the note, mention is also made of the observation of a similar phenomenon, about 1887, by a French authority and by travellers in Central Africa.—"Hawaiian Forester."

QUEENSLAND MOHAIR.

Mr. W. J. Peters, Gatton, who is establishing a herd of Angora goats, lately forwarded us a sample of mohair from his goats, which we submitted to Mr. W. G. Brown, Toowoomba, expert in animal fibres. His report states:—"The two samples forwarded to me of mohair are of excellent quality, but on the short side. The age of the staple was not stated. The longer staple is very free from the short, kempy hairs which is a marked feature of badly bred Angora goat hair. It is of good lustre and would command at least 1s. 3d. (fifteen pence) per lb., if the rest of the fleece be as free from hair as this long one. The short staple sample is finer in quality, and appears to be quite as valuable as the long one. Both are excellent in every respect but length."

Mr. Brown sent Mr. Peters a sample of high-class mohair for comparison, and as an ideal to aim at. It was obtained from Mr. W. B. Robinson, Toowoomba.

Horticulture.

THE OLEANDER AS A FLY TRAP.

Mr. C. Hoelscher, post and telegraph master at Dalby, has, for a long time been interested in the study of the flower of the oleander, and has observed that flies have been entrapped in it. Confirmation of this has now reached us, and the flowers, with their winged prisoners have been referred to Mr. F. M. Bailey, Colonial Botanist, whose note on the matter is appended. Mr. Hoelscher says:—" The flies are trapped—not poisoned. The trap upon close examination will reveal a very clever device arranged by Nature. The flowers I send are small, and, if larger ones were procured, the cunnningly devised trap would be easily seen."

Mr. Bailey says:—" The insects sent by Mr. Hoelscher were alive when I saw them. The oleanders are known to be of a highly poisonous character; but what attracted these particular flies, I cannot say. Probably it was the nectar in the flowers, in which some of the Apocynaceæ (the order to which the oleander belongs) are very rich."

TIMES OF SUNRISE AND SUNSET AT BRISBANE—1912.

Date.	September.		October.		November.		December.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·3	5·33	5·29	5·47	4·59	6·5	4·46	6 28
2	6·1	5·34	5·28	5·47	4·58	6·6	4·46	6·29
3	6·0	5·35	5·27	5·48	4·57	6·7	4·46	6·30
4	5·59	5·35	5·26	5·48	4·56	6·8	4·46	6·30
5	5·58	5·36	5·25	5·49	4·55	6·9	4·45	6·31
6	5·57	5·36	5·23	5·50	4·55	6·9	4·47	6 32
7	5·56	5·36	5·22	5·50	4·54	6·10	4·47	6·32
8	5·55	5·37	5 21	5·51	4·54	6·10	4·47	6·33
9	5·54	5·37	5·20	5·51	4·53	6·11	4·47	6·34
10	5·53	5·38	5·19	5·52	4·53	6·11	4·47	6·35
11	5·51	5·38	5·18	5·52	4·52	6·12	4·47	6·35
12	5·50	5·39	5·17	5·53	4·51	6·12	4·48	6·36
13	5·49	5·39	5·16	5·54	4·51	6·13	4·48	6·36
14	5·48	5·40	5·15	5·54	4·50	6·14	4·49	6·37
15	5·47	5·40	5·14	5·55	4·50	6·15	4·49	6·37
16	5·46	5·41	5·13	5·55	4·50	6·16	4·50	6·38
17	5·45	5·41	5·12	5·56	4·49	6·17	4·50	6·39
18	5·44	5·41	5·10	5·56	4·49	6·17	4·50	6·39
19	5·42	5·42	5·9	5·57	4·49	6·18	4·50	6·40
20	5·41	5·42	5·8	5·58	4·48	6·19	4·51	6·41
21	5·40	5·43	5·7	5·58	4·48	6·20	4·51	6·41
22	5·39	5·44	5 6	5 59	4·47	6·21	4·52	6·42
23	5·38	5 44	5·6	6·0	4·47	6·22	4·52	6·42
24	5·37	5·44	5·5	6·0	4·47	6·22	4·53	6·43
25	5·36	5·44	5·4	6·1	4·47	6·23	4·53	6·43
26	5·35	5·44	5·3	6·1	4·47	6·24	4·54	6·44
27	5·33	5·45	5·2	6·2	4·46	6·25	4·54	6·44
28	5·32	5·45	5·2	6·2	4·46	6·26	4·55	6·44
29	5·31	5·46	5·1	6·3	4·46	6·26	4·55	6·45
30	5·30	5·47	5·0	6·3	4·46	6·27	4·56	6·45
31	...	...	5·0	6·4	...	...	4·57	6·45

Phases of the Moon.

			H. M.
4 Sept.	☽	Last Quarter	11 23 p.m.
11 „	●	New Moon	1 48 „
18 „	☾	First Quarter	5 55 „
26 „	○	Full Moon	9 34 „
4 Oct.	☽	Last Quarter	6 48 a.m.
10 „	●	New Moon	11 41 p.m.
18 „	☾	First Quarter	12 6 „
26 „	○	Full Moon	12 30 „
2 Nov.	☽	Last Quarter	1 37 p.m.
9 „	●	New Moon	12 5 „
17 „	☾	First Quarter	8 43 a.m.
25 „	○	Full Moon	2 12 „
1 Dec.	☽	Last Quarter	5 p.m.
9 „	●	New Moon	3 7 a.m.
17 „	☾	First Quarter	6 6 „
24 „	○	Full Moon	2 30 p.m.
13 „	☽	Last Quarter	6 12 a.m.

Tropical Industries.

SYNTHETIC (ARTIFICIAL) RUBBER.

It is now recognised by tropical agriculturists that the sôil, climate, and rainfall in North Queensland are all that can be desired for the cultivation of rubber and coconuts. This is amply evidenced by the healthy appearance and rapid growth of such rubber trees as are planted at the Kamerunga State Nursery and elsewhere on the Northern coast lands. The expansion of the industry is, however, not so rapid as it would be were it not for the " bogey " of the manufacture of artificial rubber. We think, therefore, that, in the interests of tropical Queensland, we should place the facts in connection with synthetic rubber fully before Northern planters, and we do not doubt that a perusal of the following pages will conclusively show that there need be no hesitation as to planting rubber, seeing that the artificial product is unlikely, for many years, to come to fruition, at any event, as a commercially paying business. It is, perhaps, not generally known that it took twenty-five years of experimentation before artificial indigo was successfully placed on the market, entirely superseding the natural product; yet already it is shown that, by cultivating a new and better variety of the indigo plant, artificial indigo may yet be displaced. The following articles are well worthy of careful consideration by existing and intending rubber planters; and, as regards indigo, there is no reason, seeing what splendid water supplies there are in the numerous rivers of Papua, why indigo growing and manufacture should not gain a firm footing in that Territory. Our first article on Synthetic Rubber is taken from " Grenier's Rubber News " of 3rd August last; and the second is also from the same source:—

SYNTHETIC RUBBER.

The synthetic rubber bogey has again cropped up, alarming nervous rubber investors, many of whom have in a moment of unreasoning panic foolishly parted with splendid investment securities. By synthetic rubber is meant a substance, built up by means of the resources of the laboratory, resembling so far as chemical composition is concerned the natural product obtained from the tapping of the trees in the plantation and forest. Many chemists have made synthetic rubber; many patents have been taken out in connection with different processes; syndicates have been formed for the manufacture of synthetic rubber on a commercial scale. The end invariably has been failure, and the bankruptcy court. For many years it has been known that when India rubber is subjected to distillation by the application of heat a liquid called isoprene is formed. This, by the adoption of various methods, has been converted back into a viscious spongy mass resembling caoutchouc. This isoprene is a combination of 10 parts of carbon with 16 of hydrogen, and represented by the chemical formula $C_{10}H_{16}$. The object of the analytical chemist, then,

is to take cheap materials containing carbon and hydrogen, and by laboratory methods convert them into, first, isoprene, and finally into synthetic rubber. Up to the present, however, it has been found impossible to manufacture isoprene cheaply. Claims have been made invariably that the by-products manufactured are so valuable as to considerably reduce the cost of producing synthetic rubber.

The Latest Experiments.

A group of the British Association, including Professor Perkin, Dr. F. E. Matthews, and Sir William Ramsay, have been working for some time past on the problem of producing synthetic rubber cheaply, and the result of the investigations were communicated by Professor Perkin to a meeting of the Society of Chemical Industry on 17th June. The paper was entitled "The Production of Isoprene and its Homologues." Sensational accounts were published in the London and Provincial Press stating that artificial rubber could be produced at 1s. per lb.; and, under such headlines as "Romance of the Laboratory," "Man's Triumph over Nature," enterprising journals published sensational articles. One compiled a table showing the millions of pounds that will be saved by the new discovery. Another journal eclipsed all its contemporaries in ingenious and artistic picturesqueness by telling its readers how for several months tyres of synthetic rubber had been tried in the streets of Paris, and the synthetic tyres had proved quite equal to those made of the best hard Parà. For many of these statements there is little or no foundation in fact.

Where Success has been Achieved.

(1) Professor Perkin and the English group of scientists with which he is associated have discovered that isoprene can be obtained from iso-amyl alcohol, a constituent of fusel oil.

(2) Professor Fernbach, one of the members of the French group of the Pasteur Institute, has discovered a cheap way of producing fusel oil and acetone by permeating starch with certain ferments. The different alcohols from fusel oil have been separated by fractional distillation and by action of chlorine subsequently converted into isoprene or its various homologues, such as butadeine. This, on contact with metallic sodium, produces a rubber-like material.

(3) Dr. Matthews has discovered a simple method of polymerisation with metallic sodium, by which isoprene can be quantitatively and speedily converted into normal rubber both from the standpoint of the chemist and bacteriologist.

The experiments may well be described as elegant. They mark a considerable advance in our scientific knowledge, and in the laboratory processes of manufacturing synthetic rubber.

Where the Experiments have Failed.

The pæans of triumph raised in the lay Press are altogether premature. The experimentalists have failed on their own admission to produce

cheap isoprene not only from starch, but also from wood, coal, and petroleum. Cheap butadeine has been produced as a laboratory experiment, and butadeine can be converted into a *rubber-like material.* That is as far as an advance has been made. But there is a fundamental difference between isoprene and butadeine. Isoprene has 5 carbon atoms, and rubber a multiple of 5 carbon atoms. Butadeine has, however, only 4 carbon atoms. This is an essential distinction making for difference of properties. Those of isoprene are to a certain extent familiar, and if a process of producing isoprene cheaply is discovered, the liquid is so highly inflammable that great difficulties and dangers would attend a large-scale production. Sodium is another difficult substance to handle. The experimenting with small quantities under exact conditions in a laboratory is a very different matter from carrying out the same reactions on a commercial basis. Of butadeine and its properties there is at present practically no information, but a few statements couched in the vaguest terms showing little of the scientific spirit of accuracy, which one has the right to naturally expect from scientific investigation. We are told that fusel oil treated under special conditions with hydrochloric acid and subsequently with chloride and lime produces isoprene or a homologue of isoprene. The sodium process then converts these products into rubber. This is supplemented with the following statements:—" It is now established that—(1) The product is real rubber; (2) the product vulcanises both by the hot and cold processes; (3) it has the same behaviour to solvents, precipitants, and chemical reagents as natural rubber."

OUR CRITICISMS.

The manufacture of isoprene on a commercial basis the experimentalists admit to be a failure. This leave only the butadeine product to be dealt with. That the identity of butadeine with normal rubber has not been established is apparent to those acquainted with the methods of casual investigation. To this criticism the only reply given is that, *in the opinion of the Anglo-French* group of scientists, the natural rubbers are very varied mixtures of polymers of isoprene and its many chemical relatives. True, there is an infinite range of natural rubbers. We will assume the hypothesis as established. Then we ask: To which of the natural rubbers do the experimentalists believe that the butadeine product most resembles? It cannot resemble all, and the investigation of the differences opens up a field of research which will take a generation to unravel. The experimentalists have not succeeded yet in obtaining butadeine from ordinary rubber. Until this is successfully accomplished, we are still in the stage of hypothesis only. Further, neither the fact that the product vulcanises is proof that it is rubber, as other substances besides rubber can be vulcanised, nor is its behaviour under certain solvents, precipitants, and chemical reagents. The experimentalists have yet to produce butadeine in sufficient quantities for extended vulcanisical and other tests to be made. As regards the form of natural rubber

butadeine represents, the question is important. Fine plantation brands are driving out the inferior varieties of natural rubber, which are now becoming unsaleable. Butadeine cannot be obtained from rubbers in ordinary use; the rubber-like material obtained therefrom may be as useless as these inferior rubbers.

What is Known of Isoprene-based Caoutchouc.

The form of synthetic rubber has been obtained for some time past. It appears as a crude, spongy, viscous mass, lacking homogeneity in structure, and when stretched between the hands readily breaks. There is little " nerve " in it. Much experimenting and many processes will have to be perfected before a presentable and marketable article is produced. Each stage adds to the cost. This isoprene-based caoutchouc is inferior to the lower grades of natural rubber, and commercially of no value. Its production even on a small scale requires the greatest care owing to the inflammable character of the isoprene. The " nerve" is the physical property which largely determines the use of rubber. The "nerve" is generally ascribed by scientists to be the reticular structure of the natural rubber. When this is subjected to the action of rubber solvents, the delicate network, which consists of nitrogenous matter, is broken up, and, as the breaking process progresses, the "nerve" weakens. All synthetic rubbers are wanting in this reticular structure. Hence their lack of resiliency. Even when the problem of producing cheap isoprene is solved, the commercial value will have to be demonstrated.

Why no Cause for Planters to be Alarmed.

(1) The Group conducting the researches have admitted to the writer that the manufacture of synthetic rubber from butadeine is still in an experimental stage.

(2) Sir William Ramsay expresses the opinion that two years of experimental work will be necessary before even a start can be made.

(3) Only a few pounds have been produced; no real tests have been made.

(4) A possible selling price of 2s. 6d. per lb. is hoped for. The synthetic variety, to make its way in the market, must be forthcoming at least 30 per cent. cheaper than Nature's material.

(5) The position of synthetic rubber is thus absolutely hopeless, for it presumes in 1915 a price for fine plantation brands of 5s. per lb.

(6) The investor knows if natural rubber in 1916 falls to 3s. per lb., and the cost of production is even as high as 1s. 6d. per lb., the majority of sound Mid-East undertakings will be able to earn dividends considerably in excess of the present magnificent distributions.

SYNTHETIC RUBBER.

THE OTHER SIDE.

"Nature has not yet said to man thus far and no further." It is in the realms of science that the truth of this dictum has been best exemplified. Given a cause, science will some day accomplish the effect.

To-day, when the rubber world has, *nolens volens,* been compelled to once again consider the question of synthetic rubber and its commercial possibilities, it is comparatively easy to attract attention by differing from the general consensus of opinion and assuming the rôle of a Cassandra to a Mid-East Troy.

But, apart from the natural desire of a human being to pose as a pessimist, I think it would be well to view the question of synthetic rubber from the other side, if to serve no better purpose, at least to ease one's conscience.

It must not be forgotten that the chemists who have discovered this new process of making synthetic rubber do not claim to have made a product that is able to compete commercially with the vegetable product for, at any rate, some time to come. There are difficulties yet to be overcome. The very properties which make rubber the commercial success it is are lacking in this product of the laboratory.

Its strength, resilience, elasticity, nerve, the power to stand the *sturm und drang* of motor traffic, and perhaps its non-conductibility of electricity are all problems yet requiring satisfactory solution.

All that is claimed for it by the scientists (not by the company promoters) is a moderate degree of elasticity, easy vulcanisation, and that it is, at any rate at present, a homologue with but the smallest difference in chemical constitution from normal rubber.

But more important than the addition of another carbon atom to its chemical formula is the fact that the materials from which it is extracted are from the cheapest possible products in the world.

Whether the two years' experimental stage that is to be devoted towards its perfection will develop this hydro-carbon bastard into a rival of its elder and legitimate relative, the fact remains that many a commodity now using the baser grades of real rubber will test this cheaper article, and, if satisfactory, use it.

Many a field of industry which now finds the cost of rubber prohibitive—road-paving, for instance—may invest in the new article and ensure for it a market where rubber cannot enter.

That it will have a market to itself is more than probable.

That it will compete with rubber in its baser uses is probable.

That some day it will compete with the highest grades of rubber is not impossible.

The failure of such a condition the rubber industry can at best devoutly wish for.

At present the position of affairs may be stated to stand thus:—

The researches of Bouchardet, Walden, and Tilden proved that rubber submitted to dry distillation gave as a resultant basis a substance called isoprene—also obtainable from turpentine.

Schidrowitz, the chief scientist who condemns this new venture, states that "attempts were made to reconvert some of the products of dry distillation into rubber, and in the case of *isoprene these were attended with success.*"

This was in 1909-1910.

The attention of chemists was then directed to cheapening the cost of isoprene.

In September, 1910, Dr. F. E. Matthews, forestalling his German *confrères* by a few weeks, found that isoprene which had been left in contact with pure sodium (polymerisation) for three months had been changed into a solid mass of rubber.

This discovery eliminated one of the most expensive factors in the production of synthetic rubber.

The next step was to find a cheap commercial substance to produce isoprene.

By considering the chemical formula of isoprene (and rubber) it was found that this hydrocarbon contained 5 carbon atoms arranged in very close similarity to amyl-alcohol or fusel oil. Their attention was then directed towards obtaining a cheap source of amyl-alcohol. Starch was fixed upon as the cheapest and likeliest substance, but it was found, however, that, though starch could be split up into ethyl and amyl-alcohols, the cost of the latter would come to £130 a ton.

This was by means of a ferment.

It was here that Professor Fernbach, of the Pasteur Institute, came to their rescue and found a bacterium, not a ferment, which could transform starch not into ethyl and *amyl*-alcohols, but into acetone (which alone suffices to ensure the new company a dividend) and butyl-alcohol, the homologue or first cousin of amyl-alcohol. The difference is that butyl alcohol contains 4 atoms of carbon instead of 5.

By means of the original process butyl-alcohol was changed into *Butadeine*, the homologue or first cousin of *isoprene;* and butadeine produced the present synthetic rubber, the homologue or first cousin or ordinary rubber.

Until *isoprene* and not *butadeine* is cheaply produced, real synthetic rubber will not be produced.

Thus far has science gone.

All that remains to be worked at is the addition of that carbon atom at some stage in the process of manufacture. On that atom of carbon perhaps hangs the commercial prosperity of the greater part of the Mid-East.

The production of acetone alone will ensure sufficient profits for the company to continue its research, and the hope is not unnatural in the breasts of these scientists that some day—it may be in two years—the missing link will be found.

Given cheap amyl-alcohol, cheap rubber will result. In this connection one should remember that the experiments of Hoffman and Harries

in Germany, vouched for by Dr. Rudolph Mersel, proved that motor-car tyres made from isoprene rubber showed less wear and tear than tyres made from the finest hard Parà when submitted to identical tests.

The commander who does not ensure for himself a safe line of retreat, and who does not consider beforehand his course of action in case of reverse, is as dangerous to his army as to his country.

The mere fact that this new child of science is yet an infant should not allow an optimistic spirit to make no thought of the morrow.

It was not till years after the assured success of tea that Ceylon was able to recover from the financial depression caused by the failure of coffee.

A land cannot live on rubber alone.

Now, how does the case stand with synthetic indigo? The following paper on the subject, also appearing in "Grenier's Rubber News," will show that there is every reason to believe that the indigo plant, as a catch crop for rubber plantations, will yet come to the front as a producer of commercial indigo, especially as it is stated that it can be produced under a modern system at two-thirds of the price of synthetic indigo:—

INDIGO AS A RUBBER CATCH CROP.

It seems strange that, just at the time when the air is full of Synthetic Rubber and Professor Perkin's name so prominently before the public, the question of indigo cultivation as a rubber catch crop is engaging the attention of planters. Sir William Perkin, father of Professor Perkin, as our readers may be aware, was the discoverer of aniline dyes, which dealt the deathblow to the cultivation of indigo, and it must be interesting, therefore, to watch the indigo crusade now being conducted by Baron Schrottky, a well-known indigo planter and experimentalist. There was a fairly large gathering of planters and others at the Department of Agriculture on Wednesday, the 24th June, when the Baron gave an address on the advantages of indigo as a catch crop. He referred to the paper read in Ceylon in March last on the subject of the natural indigo and its decline since 1896.

The "Calcutta Englishman," in its issue of 9th March, 1911, he said, summarised the work done as follows:—"The distinct points of progress towards the rehabilitation of the natural indigo industry have been achieved in recent years, viz.:—

(1) The cultivation of a new and better yielding variety of the indigo plant (Java-Natal indigo, or *Indigo-fera arrecta*); this gives a 50 per cent. better yield than the plant formerly in cultivation.

(2) Improvements in manufacture by scientific methods; these give promise of an increased out-turn of dye, nearly twice as much as the ordinary manufacturing process will yield.

(3) The marketing of the dye in the form of paste, which the dyers have declared to be absolutely essential if they are to use natural indigo."

The Baron thought nearly the whole of the Malay Peninsula was well suited for indigo cultivation by reason of the evenly distributed rainfall.

The new method of manufacture was then dealt with by Baron Schrottky. The output of dye was 3 lb. of standard indigo paste for every 100 lb. of green plant; 40,000 lb. of green plant per acre, which Dr. Lock did not consider an excessive estimate, would therefore yield 1,200 lb. of indigo paste, the value of which, at 8d. per lb., was £40 sterling f.o.b. Straits Settlements. The all-in costs he estimated to amount to £20, so that there was a very large margin of profit. The Baron added that there was even greater inducements for growing indigo as a subsidiary crop to rubber and cocoanuts; because one of the by-products was a large quantity of the most perfect natural manure. Indigo was one of the few plants, besides, which enriched the soil on which it was grown. In Ceylon, he stated, rubber trees had grown most vigorously where most crowded by indigo.

Baron Schrottky recommended that a start should be made with 150 to 200 acres, and produced plans of a factory to deal with this amount which could be erected complete for 7,000 dollars. He recommended the sowing of 42 lb. of seed to the acre, and said at the end of the year the yield of seed would be 5 cwt. The figures he had given were based on the use of *I. arrecta* seed.

Regarding the question of extensive planting of indigo, Would there be a market for the natural indigo now that synthetic had secured such a hold? To this query the Baron replied to a representative of the "Ceylon Observer" that in his opinion 32,000 lb. of green plant should be secured per acre, yielding 790 lb. of standard paste, and that this could be sold at two-thirds of the price of synthetic indigo. Labour (says our Ceylon contemporary), of course, is a difficulty in regard to extensive cultivation of indigo by itself.

Mr. Alex. W. Playne, 9 Stanley street, Bedford, 28th June, writing to the "Financier," after speaking of the deception practised by manufacturers of dyed cloths, says:—"If a few tailors were prosecuted for selling logwood blues as 'indigo dyed,' they would pretty soon compel the cloth manufacturers to look into what goes on in the dye-house!"

So-called synthetic indigo is totally different from real indigo; they require to be treated differently in order to bring out their full colour. This means that these dyers who get more colour out of synthetic than out of natural indigo are using vats which do not do justice to the latter.

And if you extract the dye from a cloth the indigo extracted dries to a lump that requires pestle and mortar to grind to powder, while synthetic dries to a lump that crumbles to powder between finger and thumb. Finally, synthetic fades in the sun; indigo does not. I have challenged the synthetic people for some eighteen years, and have had no replies.

We think that indigo cultivation deserves a trial.

MANILA HEMP SCUTCHING MACHINE.

The local nomenclature of various fibres produced in temperate and in tropical climates has given rise to some confusion in the minds of those in this State who are growing or who propose to grow fibre-producing plants. There is a prevalent idea that *all* fibres are hemp. This is manifestly incorrect. To begin with, hemp is the product of what is botanically known as *Cannabis sativa.* This is a hardy annual growing to a height of 7 to 10 ft. in temperate climates and in the tropics, as in Indo-China even to 20-25 ft. in height. This plant grows so rapidly that, under favourable conditions, the crop grows 2 to 3 ft. in the first month after it comes up, and 3 to 10 ft. in the next month, whilst from seed time to maturity requires but 100 days. The fibre is produced from the inner bark, and is closely bound together by a resinous gum, which has to be dissolved by some alkaline solvent. The yield of fibre is from 500 to 1,500 lb. per acre, which is worth from 3d. to 5d. per lb. The seed is used as a bird and poultry food, and for making oils to mix with paints and for soap-making.

This plant and the Indian Sunn hemp, with a few other similar plants, are the only true hemps.

We find that the fibres of such plants as Sisal, Murva, New Zealand Flax, Ramie, Fourcroya (Mauritius Hemp), Manila (Banana fibre) are indiscriminately called hemp. When inquiries are made about machines for extracting fibres from these plants, some misapprehension naturally arises. A machine which is adapted to flax or true hemp extraction is useless for, say, extracting sisal or Fourcroya fibre, and such a machine is also too powerful for extracting the fibre from Murva (Sansivieria or Bowstring Hemp), whilst, as for Manila fibre, or Ramie, none of these machines are of any use.

We had occasion (in May, 1911) to draw attention to the trials of machines whose inventors claimed for them that they were adapted to the extraction of the fibre of the *Musa textilis,* the fibre-producing banana of the Philippines, and we quoted from the "Philippine Agricultural Review" and from the "Mindanao Herald" on the subject of trials of four machines, at the last Philippine Carnival, to show that there was still a great doubt whether any machine, with the exception perhaps of the McLane machine, would come up to expectations.

As the outcome of our article, the Queensland Department of Agriculture and Stock has received a letter (4th September, 1912) from Mr. Carl Wegel, Mossman ,stating that, on reading the article, he wrote to the Bureau of Agriculture of the Philippine Islands, and received from Mr. F. W. Taylor, Director of Agriculture, information about trials of machines, which he has permitted us to publish as follows:—

"In reply to your letter of 13th May, 1912, in which you request information relative to the trials of the McLane and Crumb stripping machines, made at Zamboanga during the 1911 Fair, I have the honour to enclose you herewith a copy of the reports of the committee as published in the "Mindanao Herald," under dates of 11th March and 15th April, 1911.

"The committee that conducted the trial consisted of one engineer, one mechanic, and one planter, all of them disinterested parties. The report is complete, and the results of the trial are very clearly and properly worked out. The reason for not giving any official publicity by this Bureau to the results of this trial was due to the fact that we had no representative on the committee during the tests. Our represenative, who was in Zamboanga at the time, and who was to be on the committee, had to leave the city on the morning of the day on which the trials were to be conducted."

THE TRIAL OF THE McLANE AND CRUMB FIBRE STRIPPING MACHINE AT ZAMBOANGA.

The following information is taken from the reports of the committee as published in the "Mindanao Herald," under dates of 11th March and 15th April, 1911:—

"Each machine was given thirty-six stalks of Abacá [Manila hemp, *i.e., Musa textilis,* the fibre producer of the banana family.—Ed. "Q.A.J."], weighing 1,000 kilos (2,200 lb.), and the committee noted the following facts in connection with the contest:—

"Both machines were operated by 3½-h.p. gasoline engines, "hit or miss" governor connected to the machine with belts. The M'Lane machine required a trifle more than three times as much power for its operation as the Crumb machine. The McLane machine used a crew of eight men for preparing the Abacá (from stalks already cut, but not split), and passing it through the machine. The Crumb machine used seven men for the same purposes.

"The cost of the two machines and their accessories are about as follows:—

McLANE MACHINE.

	Pesos.	Approximate Sterling Value. £	s.	d.
Machine only	2,000.00	416	13	4
Motive power	500.00	104	3	4
Spare parts, tools, &c...	20.00	4	3	4
	2,520.00	£525	0	4

CRUMB MACHINE.

		£	s.	d.
Machine	400.00	83	6	8
Motive power ..	200.00	41	13	4
Spare parts, &c. ..	6.00	1	5	0
	606.00	£126	6	0

"The McLane machine completed its task in exactly two hours' running time. The Crumb machine finished in one hour and fifty-eight minutes. Each machine was stopped a number of times for cleaning and adjustment, the McLane machine more frequently than the other.

This time was, according to the rues, counted against the machine. The Crumb machine laid off three of the labourers one half-hour before the completion of its task, thereby saving their wages during that time.

"Upon the completion of the test, the stripped Abacá was dried and weighed by the committee. The McLane machine produced 18.72 kilograms (40.7 lb.) of dried fibre; the Crumb machine, 15.73 kilograms (34.2 lb.)—each from 1,000 kilos. (2,200 lb.) of raw Abacá. As each stripped thirty-six stalks, the average output per stalk was—for the McLane machine, 0.520 kilograms (1.13 lb.); for the Crumb machine, 0.437 kilograms (0.95 lb.). Both machines appeared to be in good condition at the end of the test, and neither broke any parts.

"The committee estimates the cost of production of these amounts as follows:—

McLane Machine.

	Pesos.	Approximately.
Cost of tumbling and hauling ..	0.35	.. 1 $4\frac{2}{3}$
Wages of operators, two hours ..	1.67	.. 7 $4\frac{1}{2}$
Cost of gasoline, waste, &c. ..	.45	.. 2 $3\frac{1}{2}$
Interest and depreciation, 30 per cent. per annum, on first cost of machine and equipment ..	.50	.. 2 1
Drying and baling	.032	.. 0 $1\frac{3}{4}$
	3.002	.. 13 $4\frac{3}{4}$
Average cost per picul (137 lb.) of stripped Abacá at plantation	10.12	.. £1 2 2

Crumb Machine.

Cost of tumbling and hauling ..	0.35	.. 1 $4\frac{2}{3}$
Wages of operators, two hours ..	1.25	.. 5 $2\frac{1}{2}$
Cost of gasoline, oil, waste, &c. ..	0.15	.. 0 $7\frac{1}{2}$
Interest and depreciation as above	0.12	.. 0 6
Drying and baling	.025	.. 0 $1\frac{1}{4}$
Total	1.895	.. 7 10
Deduct 1/60 of running cost for two minutes less than two hours	0.025	.. 0 $1\frac{1}{4}$
	1.87	.. 7 $9\frac{3}{4}$
Average cost per picul ($137\frac{1}{2}$ lb.) of stripped Abacá at plantation	7.48	.. £1 11 2

"Seventh.—The Abacá stripped by the two machines was taken to Manila by Mr. Hale (one of the members of the committee), and submitted to McLeod and Co. for classification. The bundles of Abacá were unmarked, and the classifiers did not know by whom it was stripped, nor whether it was hand or machine stripped. The Abacá from the McLane machine was classified in two classes. About three-fifths of the entire amount was classified as No. 1A, and its selling price in Manila placed at 21.00 pesos = 87s. 6d. The remaining two-fifths was classified as 1B, and its price fixed at 19.50 pesos = 80s. 3d. The average value of this lot of Abacá on the Manila market was thus 20.40 pesos per picul (137½ lb.), or 84s. 8d. From this amount must be deducted the cost of freight to Manila, and handling from the plantation to the wharf, and from the wharf to the market, which is placed by the committee at about 1.25 pesos per picul (5s. 2½d.), leaving the net value of the stripped Abacá at the plantation 19.75 pesos per picul = 82s. 3½d. per 137½ lb.*

"The Abacá from the Crumb machine was all classified as No. 1A, with a market price of 21.00 pesos = 87s. 6d. Making the deduction as above, the net value per picul is 19.75 pesos = 82s. 3½d.

"In making the deduction for freight and cartage, the plantations are assumed to be at Davao.

"Based on the cost of production and stripping, the net profit per picul at the plantation is as follows:—

	Pesos.	£	s.	d.
For the McLane machine ..	7.49 ..	1	11	2½
For the Crumb machine ..	10.43 ..	2	3	5½

"Based on the cost of stripping only, the net profits per picul are:

	Pesos.	£	s.	d.
For the McLane machine ..	10.20 ..	2	2	6
For the Crumb machine ..	13.65 ..	2	16	10½

"According to the conditions of the contest, the machine showing the greatest difference between cost and selling price, or, in other words, the greatest profit, was to be the winner. The committee therefore declares the Crumb machine to be the winner of the contest."

A POSSIBLE CHEAP METHOD OF SCUTCHING SISAL LEAVES.

At present the principal difficulty in the way of an expansion of the sisal hemp industry in Queensland is the great cost of scutching machinery. There is a possibility that this may be overcome by the use of the Crosbies Patent Improved New Zealand Flax Stripper. Mr. A. C.

* This works out at something like £67 per ton. The price of "best marks" of Manila hemp, given in Messrs. Landauer and Co.'s Market Report for 28th August, 1912, is from £60 to £62 per ton.—Ed. "Q.A.J."

English, of Rigo, Papua, has for the past eight months been in correspondence with the makers of this machine, with the object of proving what is claimed for it—viz., that it will successfully extract the fibre from sisal leaves. Mr. English is in Sydney, awaiting the result of the scutching of 100 large sisal leaves supplied by Major Boyd, who forwarded them to Sydney in the middle of last month. The fibre will be sent to Mr. English, together with all details as to the machinery. He says that, if the new machine proves a success, it will mean a good thing for the owners of small hemp plantations, and bring down the exorbitant prices of the large machines. He is furthermore trying to interest people in the South to go in for sisal hemp in North Queensland and Papua, feeling quite satisfied that there is no other investment better if the proper land is selected and planted scientifically and systematically. Mr. English owns a large sisal, rubber, and cocoanut plantation in Papua; and the sisal has proved a highly lucrative crop, even when the fibre brought £9 per ton less in the market than it does to-day, the price given in Landauer's Fibre Market Report for 11th September, 1912, being for German East African sisal £33 per ton—a price which has not been reached since 1908.

SISAL HEMP AT GLADSTONE.

Mr. James Cornwell, who is firmly impressed with the value of sisal hemp as a good paying crop, has for some years been engaged in forming a plantation about four miles from Gladstone. The plants have made very vigorous growth, and a first crop will be taken off next year.

Plate 41.

The land on which the plants are growing is forest soil, very stony in parts, and it is notable that it is on the rocky ground where the plants thrive best. This has also been the experience of Southern sisal planters. The age of the plants at "Aston," Mr. Cornwell's estate, ranges from six months to four years, and, as will be seen from the illustration, they

PLATE 42.—SISAL PLANTS ON ROCKY AND ALLUVIAL SOILS.

are doing well. During the past winter, a bush fire swept through the plantation, and did some damage to the younger plants, but these have all started to shoot out again, and will doubtless give a good return two or three years hence.

PLATE 43.—THREE-YEAR-OLD SISAL PLANTS AT ASTON.

Chemistry.

ANALYSES OF FERTILISERS.

By J. C. BRÜNNICH.

Since the introduction of "The Fertilisers Act of 1905" it has been customary to check the composition of all our commercial fertilisers by getting our inspectors to collect once or twice a year samples from all dealers, and to have these samples analysed at our Agricultural Laboratory.

A complete list of these **analyses** carried out recently is herewith published for the information of farmers.

In accordance with the Act, every dealer, manufacturer, importer, or agent who deals in fertilisers for the purposes of trade is required to register each year, giving the names or brands of fertilisers dealt in by him. We have now fifty-eight registered dealers in our State. Upon the sale of any fertiliser the seller must supply to the buyer an **invoice certificate** signed by the seller or his agent, stating full name and place of business of the seller, trade mark, brand, or other sign used to identify such fertiliser; quantity of the fertiliser or net weight in lb.; and the composition of the fertiliser, giving the respective amounts of nitrogen, phosphoric acid, and potash contained therein. Such a certificate can be attached in form of a label to each bag or package, or it may be supplied separately in form of printed slips, but the **bag must be distinctly branded** with the number of net pounds of fertiliser in the bag or package, and the figure, trade mark, or sign under which the fertiliser is sold.

The latitude allowed under the Act, in any **deficiency** in the composition, in order to allow for slight variations in manufacture, is a fairly liberal one, amounting to 5 per cent. of the total nitrogen or of potash certified to be present, if the fertiliser contains not less than 10 per cent. of nitrogen or potash, and 7 per centum of the total phosphoric acid certified to be present, if the contents of phosphoric acid are not under 15 per cent. In the case of fertilisers containing smaller amounts of fertilising ingredients, less than 10 per cent. of nitrogen or potash, and less than 15 per cent. of phosphoric acid, the amounts of deficiency allowed are—nitrogen and potash ½ per cent., and phosphoric acid 1 per cent.

On the whole, it may be stated that the composition of the fertilisers agrees fairly well with the guaranteed amounts, which, for this reason, are not given on the table.

Hitherto great confusion has existed through stating the composition of fertilisers in various ways, giving, for instance, phosphoric acid as bone phosphate, tricalcic phosphate; nitrogen as ammonia and ammonium sulphate; potash as potassium sulphate and potassium

chloride, &c. All such statements only mislead the farmer, and to avoid this, the Act provides for the statement of the valuable fertilising ingredients in percentage amounts of **nitrogen** (N), **potash** (K_2O), and **phosphoric acid** (P_2O_5).

The conversion of the amount of one compound into another is very simple, and as many manuring formulæ contain the old denominations, I will repeat here a table for such conversion :—

Amount of—		Multiplied by—	Gives the Corresponding Amount of—	
Ammonia	NH_3	0·824		
Ammonium sulphate	$(NH_4)_2SO_4$	0·212	Nitrogen, N.	
Sodium nitrate (Chili salpetre) ...	$NaNO_3$	0·165		
Potassium nitrate (salpetre)	KNO_3	0·139		
Nitrogen	N	1·214	Ammonia, NH_3	
Nitrogen	N	4·714	Ammonia sulphate	
Potassium sulphate	K_2SO_4	0·541		
Potassium chloride	KCl	0·631	Potash, K_2O	
Potassium nitrate	KNO_3	0·466		
Potash	K_2O	1·850	Potassium sulphate	
Tricalcic phosphate	$Ca_3P_2O_8$	0·458	Citrate insoluble	Phosphoric
Monocalcic phosphate ...	$CaH_4P_2O_8$	0·607	Water soluble	acid
Tetracalcic phosphate	$Ca_4P_2O_9$	0·391	Citrate soluble	P_2O_5
Limestone, marble	$CaCO_3$	0·560	Lime, CaO	
Gypsum	$CaSO_4$	0·411		

It will be noticed in this table, and also in the table of analyses, that **phosphoric acid** appears under three different headings—**water soluble, citrate soluble,** and **citrate insoluble phosphoric acid.** A short explanation of these terms will not be out of place.

In bones, and in most of the mineral phosphates, phosphoric acid exists in combination with lime, in the form of a calcium phosphate : **Tricalcic phosphate,** which is insoluble in water and in citric acid solutions, but soluble in mineral acids On account of this insolubility the action of bone manure and mineral phosphates is exceedingly slow, and may extend over many years. The finer the bones or the phosphates are crushed or powdered the quicker will be the action, and for this reason the fineness of the bone meal is of importance, and should be stated.

When strong sulphuric acid is allowed to act on this insoluble tricalcic phosphate, part of the lime combined with the phosphoric acid is withdrawn, lime sulphate or gypsum being formed and the phosphoric acid is left in the form of **monocalcium phosphate.**

$Ca_3P_2O_8$	+	$2H_2SO_4$	=	$2CaSO_4$	+	$CaH_4P_2O_8$
Bone phosphate or tricalcic phosphate.		Sulphuric acid.		Gypsum.		Monocalcium phosphate or superphosphate.

This new compound is soluble in water, and therefore readily available to the plants, but on account of the special process of manufacture it is the most expensive form of phosphoric acid in our fertilisers. The superphosphate is generally manufactured from steamed bones, bone ash, and mineral phosphates Mineral phosphates containing a high amount of iron or alumina are not suitable for the manufacture of superphosphates, because these bases readily recombine with this acid phosphate, to form again insoluble phosphates, called reduced or reverted phosphates. A similar change would take place if lime were added to superphosphate, and also in soils containing a large amount of lime, a **dicalcium phosphate,**

$Ca_2H_2P_2O_8$, may be formed, which is insoluble in water, but soluble in citric acid solutions. Another form of a lime phosphate is found in basic slag or Thomas phosphate—namely, **tetracalcium phosphate,** $Ca_4P_2O_9$ which also is insoluble in water, but soluble in saline solutions, particularly such which contain salts of citric acid. These last two compounds are, therefore, classed as citrate soluble phosphoric acid, which is fairly readily absorbed by the plant roots, and, therefore, comes close in its value to the water soluble phosphoric acid. Basic slag is an artificial product, and should be ground as fine as possible, and a good sample of this fertiliser should nearly all pass through a sieve having 100 meshes to the linear inch. Thomas Phosphate is one of the cheapest and best sources to supply phosphoric acid ; it is of particular value to sour lands, deficient in lime but rich in humus.

The amount of citrate soluble phosphoric acid is generally determined in basic slag only ; and in many instances the phosphoric acid, given as citrate insoluble in the accompanying table of analyses, may contain small amounts of citrate soluble phosphoric acid.

Nitrogen is the most expensive of all the fertilising ingredients of a manure, and is chiefly supplied in form of **nitrate nitrogen,** as in Chili saltpetre, or in form of **ammonia salts,** as in ammonium sulphate, or in form of organic nitrogen, as in blood, meatworks manure, &c. Nitrate of soda is a very quick-acting manure ; nitrogen in the form of nitrate is in the most available form, but nitrates are not readily retained or absorbed by the soil, and, therefore liable to be washed away by heavy rains. Nitrogen n ammonium sulphate is not in such an available form, as it has to be changed into nitrates by the process of nitrification. Favourable conditions and lime salts are necessary for this process, and in soils very deficient in lime this manure, therefore, may give poor or no results. Ammonium salts are retained and absorbed by the soil, and losses in the drainage water are not to be feared.

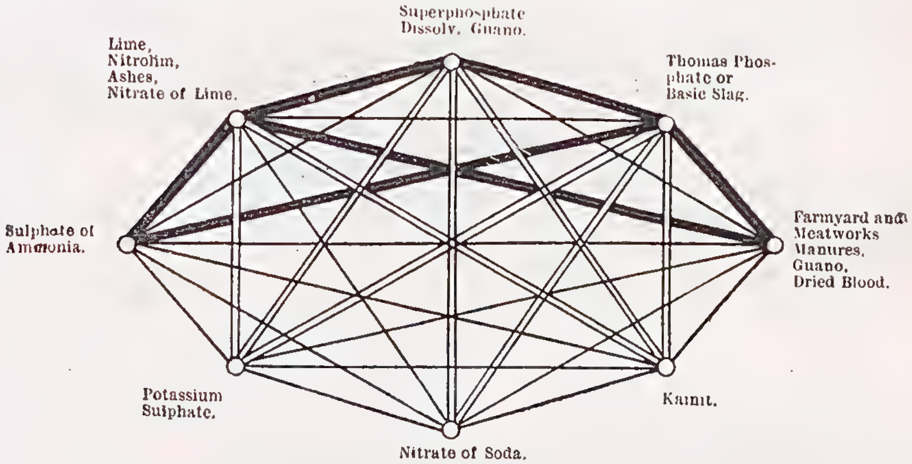
Of particular interest are the samples of **nitrate of lime,** and **nitrolim** or **calcium cyanamide,** of which large quantities are being imported.

These artificial fertilisers, which are really produced from nitrogen in the air, have given excellent results in a very large number of manuring trials, conducted the last three or four years, all over the world. I believe that our soils, of which a great number are rather deficient in lime, will derive particular benefit from these nitrogenous manures. The form of nitrogen in nitrolim is apparently nearly as available as the nitrogen of nitrates, much quicker in action than ammonia nitrogen, and not depending on the presence of lime in the soil. Nitrate of lime has the great advantage over nitrate of soda of not draining so easily through the soil. Nitrate of soda rather tends to exhaust soils, and spoils their physical conditions by depriving them of the lime, which faults are prevented by using nitrate of lime. Nitrolim is a very fine slate black powder, not liable to cake. As already stated, the action of this manure is only slightly slower than that of nitrates, and the large amount of lime (up to 50 per cent.) which it contains is in itself a great advantage. I believe that this new manure will prove of great value to our pineapple farmers and cane-growers.

Potash is generally used in the form of potassium sulphate. The chloride and kainite are as a rule not suitable to our soils.

In studying the composition of the mixed fertilisers on the table of analyses, it will be noticed that in many cases the amounts of phosphoric acid are rather high as compared with the amounts of nitrogen and potash. For this reason I generally recommend farmers to make their own mixtures from the pure concentrated manures, according to the requirements of their soil and crops, but excellent mixtures of artificial fertilisers suitable for various crops may be obtained from several firms.

When **mixing fertilisers** together, such mixtures must be avoided which would lead to decomposition, which, for instance, would take place if ammonium sulphate was mixed with lime or with Thomas phosphates, superphosphate with lime ; or which may cause caking, like mixing kainite with Thomas phosphate. A very simple guide for the mixing of manures is given in the accompanying diagram, devised by Dr. Geekens, which I slightly modified, however, to apply to our local conditions.



Manures joined by a *heavy black line* should *never be mixed* together ; those connected by a *double line* must only be *mixed immediately before use* ; and those joined by a *thin single line* may be safely *mixed* together *at any time.*

It is a matter of extreme difficulty to fix the monetary value of a manure, as so many factors influence the value. Cost of manufacture and mixing, bagging, rebagging, labelling, loss during storages, deterioration and decomposition on keeping, carriage and freight, &c., have to be taken into consideration. Again, in many cases the value derived from the chemical composition does not represent the actual value of the fertiliser, which depends upon many causes, local conditions, and requirements.

Some method of comparison is absolutely necessary, and for this purpose it is customary to use unit values, which are the cost price of 1 per cent. per ton of the various fertilising constituents, or actually the cash value of 22.4 lb. of each ingredient. For instance, in a sulphate of ammonia, costing £15 per ton, containing 20.68 per cent. of nitrogen, the unit value of nitrogen would be $\frac{15 \times 20}{20 \cdot 68} = 14.5\text{s.} = 14/6.$

The following **unit values** were approximately fixed for the calculation of the **manurial value per ton in Brisbane :—**

Nitrogen	as nitrate	16	0
	in ammonium salts	14	6
	in blood, fine bone, &c.	14	6
Potash	as sulphate	5	6
	as chloride	5	0
	water soluble	5	3
Phosphoric acid	citrate soluble	4	0
	Insoluble as in fine bones	3	0

As an example we will calculate the value of the mixed fertiliser No. 297, "Hasell's Maize Manure" of the Farmers' Fertilizers Corporation, Ltd., which is guaranteed to contain 15.75 per cent. water-soluble phosphoric acid, 2.25 per cent. of nitrogen, and 1.75 per cent. potash. By analysis we find that this mixture contains 16.01 per cent water-soluble acid, .59 per cent. insoluble phosphoric acid, 5.44 per cent potash, and 2.46 per cent. of nitrogen, and the value per ton is calculated as follows :—

N	2.46	×	14s. 6d.	=	35.7s.
K_2O	5.44	×	5s. 6d.	=	29.9s.
Water sol. P_2O_5	16.01	×	5s. 3d.	=	84.0s.
Insol. P_2O_5	.59	×	3s.	=	1.8s.
					151.4s. = £7 11s. 5d.

The advertised price of this manure is £6 15s. per ton, free on truck or steamer at Newcastle

On the whole, it may be stated that these comparative manurial values fairly well represent the market value, if the manures are purchased on a large scale. It is, of course, quite impossible to get manures in small lots of 1 or 2 cwt. at this price, particularly such manures as superphosphate and nitrate of soda, which require frequent rebagging.

Farmers have the means in their own hands to obtain cheap and reliable fertilisers—they simply have to co-operate and order large quantities, a few months ahead, and in this case the fertilisers will be obtained just as cheaply here in Brisbane as in Sydney or Melbourne.

Of course, for our Western and Northern farmers the freight on manure will considerably raise the cost, but even in these cases considerable saving will be effected on ordering large quantities, and all manure vendors will make special quotations for such orders.

In order to encourage the use of fertilisers, and more particularly to induce experimenting on the part of our agriculturists, I give herewith a

table of the **approximate manurial requirements of various crops** in lb. per acre :—

MANURIAL REQUIREMENTS IN LB. PER ACRE.

—	Nitrogen.	Phosphoric Acid.	Potash.	Lime.
Bananas	30— 60	50—80	30—160	56
Barley	20— 40	20—53	50— 95	30
Barley, Brewers'	15— 20	30—65	60— 95	30
Beans	0— 27	20—56	75—130	70
Cabbages	100—200	50—70	50—150	150
Carrots	50— 70	15—25	40— 75	56
Cauliflowers	100—150	30—50	30— 60	56
Citrus Fruit	40— 80	30—40	40— 80	40
Corn	20— 80	20—53	50—110	30
Cotton	20— 30	30—60	15— 30	70
Cucumbers	30— 56	20—36	50— 72	20
Lucerne	0— 10	40—70	65—100	140
Mangolds	50— 80	30—70	100—160	56
Meadowlands	50— 75	20—30	80—110	40
Onions	60— 81	20—36	50— 80	56
Peas	0— 13	20—56	56—100	70
Pineapples	50— 75	50—75	100—150	70
Potatoes	20— 53	20—50	67—100	30
Rape	50— 70	40—70	60— 80	80
Sisal Hemp	10— 20	20—46	50— 70	50
Sorghum	30—100	30—60	70—150	30
Sugarcane	30— 80	20—60	50—100	50
Tobacco	50—140	50—90	80—150	70
Tomatoes	30— 50	50—80	50— 80	30
Turnips	90—112	20—33	100—150	80
Wheat	10— 40	15—56	20— 65	30

From this table the necessary amounts of fertilisers to be applied per acre may be easily calculated. We take, for instance, Cabbages, which require a heavy application of manure, and wish to calculate the smallest amounts required per acre on an average class of soil.

The 100 lb. of nitrogen can be supplied by application of 485 lb. of ammonium sulphate; or 790 lb. of dried blood; or 630 lb. of nitrate of soda.

The 50 lb. of phosphoric acid can be supplied by 280 lb. of superphosphate or 200 lb. of bonemeal.

The 50 lb. of potash would be supplied by 100 lb. of sulphate of potash.

As a rule, in land under cultivation for some time, complete fertilisers, containing all the three principal plant foods, will be required; but in some instances, one or the other may have to be considerably increased in order to get the best results. This can be generally ascertained by experimenting on a small scale, or a soil analysis may also give the required information. An excess of any particular plant food can be very harmful.

Formulæ of complete fertilisers for farm and orchard were published in the July, August, and September numbers of the "Queensland Agricultural Journal."

The effect of all artificial fertilisers will be very much increased if small quantities of **stable manure** can be applied at the same time. The presence of organic matter in the form of **humus** is of the greatest importance to keep up the fertility of a soil; and in a loose well-worked soil the manures are always more effective.

When we consider the functions of the various plant-foods, it may be stated as a general rule that **potash,** which is found most abundantly in young leaves and twigs of plants, is intimately connected with the production of starch, sugar, and other carbohydrates in the leaves, and subsequent transference of these bodies to the fruits. Part of the potash is generally returned back to the soil after it has done its work in the plant.

Nitrogen promotes the growth of leaves and stems, and rather retards maturity and development of buds and flowers. The leaves show generally a deep green colour, and the whole of the plant becomes more vigorous in its growth by the application of nitrogenous manure. The amount of nitrogen in the plant itself and corresponding amounts of proteins are generally increased.

Phosphoric acid has a rather ripening effect on plants. Phosphates are generally found in the seeds, partly in association with the proteins and partly associated with fats, more particularly in Lecithin, a highly nutritious fatty compound, found in many seeds. No plant would produce seeds unless a sufficient quantity of phosphoric acid in the form of phosphates is present in the soil.

Lime aids in decomposition of organic matters, and also converts many compounds into a more available form. Its chief action, however, is to improve the physical condition of soils, particularly loosening heavy clay soils, and also, again, giving body to light sandy soils. Lime also counteracts any acidity produced by decaying vegetable matters.

ANALYSES OF FERTILISERS.

Lab. No.	Fertiliser.	Where Obtained.	Moisture.	Phosphoric Acid P_2O_5. Water Soluble.	Citrate Soluble.	Citrate Insoluble.	Total.	Potash, K_2O.	Nitrogen, N.	Comparative Manurial Value per Ton.	Remarks.
			%	%	%	%	%	%	%	£ s. d.	
	Simple Fertilisers : Potash Manures.										
342	Sulphate of Potash (Shirley's)	Paul and Gray, Brisbane	·54	...	...	...	...	52·75	...	14 10 1	97·60 per cent. Sulphate of Potash
301	Ditto ditto (Hasell's)	Redmond Bros., Bundaberg ...	·28	...	...	...	...	52·35	..	14 7 10	96·85 ditto ditto ditto
265	Ditto ditto	Campbell and Amos, Bundaberg ...	·16	...	...	...	...	53·18	...	14 12 6	98·38 ditto ditto ditto
353	Ditto ditto	Webster and Co., Brisbane	·54	...	...	...	...	52·95	...	14 11 2	97·96 ditto ditto ditto
	Simple Fertilisers : Nitrogenous Manures.										
305	Sulphate of Ammonia (Hasell's)	Redmond Bros., Bundaberg ...	1·40	...	...	...	...	...	19·76	14 6 0	93·15 per cent. Sulphate of Ammonia
338	Sulphate of Ammonia (Shirley's)	Paul and Gray, Brisbane	·60	...	...	...	...	...	20·02	14 10 4	94·38 ditto ditto ditto
339	Sulphate of Ammonia (Brisbane Gas Co.)	Ditto ditto	·84	...	...	...	...	...	20·27	14 13 10	95·56 ditto ditto ditto
264	Ditto ditto ...	Campbell and Amos, Bundaberg ...	·06	...	...	...	...	...	20·02	14 10 4	94·38 ditto ditto ditto
349	Ditto ditto ...	Webster and Co., Brisbane	2·18	...	...	...	...	...	19·48	14 2 6	91·83 ditto ditto ditto
2315	Sulphate of Ammonia ...	Brisbane Gas Co.	·07	...	...	...	...	...	20·48	14 16 11	96·55 ditto ditto ditto
269	Nitrate of Soda	Campbell and Amos, Bundaberg ..	·34	...	...	...	...	...	15·83	12 13 4	95·94 ditto Nitrate of Soda
304	Ditto ditto (Hasell's)	Redmond Bros., Bundaberg ...	·18	...	...	...	...	...	15·90	12 14 5	96·36 ditto ditto
350	Ditto ditto	Webster and Co., Brisbane	1·44	...	...	...	...	...	14·75	11 16 0	89·40 ditto ditto
302	Nitrolim (Hasell's)	Redmond Bros., Bundaberg ...	·70	...	...	...	...	...	18·67	14 18 8	
359	Ditto ditto	Martin O'Donohue, Innisfail ...	·84	...	...	...	...	...	19·10	15 5 7	
	Bone, Blood, Meatworks Manures, &c.										
311	Bone Dust (Queensland Fertilser Co., Runcorn)	H. A. Petersen, Brisbane	6·56	...	...	24·72	24·72	...	3·52	6 5 2	Coarse, 68 p. cent. ; fine, 32 p. cent.
262	Ditto	Campbell and Amos, Bundaberg ...	7·20	...	...	23·72	23·72	...	3·56	6 2 9	Coarse, 50 p. cent. ; fine, 50 p. cent.
220	Ditto	J. Holmes, Toowoomba	9·20	...	...	25·70	25·70	...	3·44	6 6 11	Coarse, 59 p. cent. ; fine, 41 p. cent.

ANALYSES OF FERTILISERS—*continued.*

Lab. No.	Fertiliser.	Where Obtained.	Moisture.	Phosphoric Acid P_2O_5. Water Soluble.	Citrate Soluble.	Citrate Insoluble.	Total.	Potash, K_2O.	Nitrogen, N.	Comparative Manurial Value per Ton.	Remarks.
			%	%	%	%	%	%	%	£ s. d.	
	Bone, Blood, Meatworks Manures, &c.—*continued.*										
313	Bone Dust (Queensland Fertiliser Co., Runcorn)	T. Wood, Brisbane	8·28	...	...	24·40	24·40	...	4·43	6 17 5	Coarse, 74 p. cent.; fine, 26 p. cent.
312	Ditto ditto ...	Summerlin, Brisbane	8·66	...	...	23·45	23·45	..	4 35	6 13 5	Coarse, 68 p. cent.; fine, 32 p. cent.
398	Ditto ditto ...	Francis and Co., Ipswich	8·94	...	...	24·60	24·60	..	3·16	5 19 7	C arse, 72 p. cent.; fine, 28 p. cent.
266	Dried Blood	Campbell and Amos, Bundaberg ...	8·20	...	...	...	...	...	13 62	9 17 6	
2119	Ditto	Q.M.E. and A. Co., Ltd., Brisbane...	14·23	...	...	...	...	...	10·11	7 6 10	
2310	Ditto	Ditto ditto ...	9·39	...	...	...	...	...	11·58	8 8 0	
2498	Ditto	Thos. Borthwick and Sons, Brisbane	20·55	..	...	1·32	1·32	...	10·43	7 15 11	Fat, 1·17 per cent.
100	Ditto	Bowen Meat Works	14·49	...	...	...	...	...	12·60	9 2 8	
197	Fertiliser (Baynes Bros., Brisbane)	Gleeson, Stanthorpe	10·40	...	...	...	17·05	...	4·50	5 16 5	
207	Ditto (Fitzroy)	Campbell and Amos, Bundaberg ...	7·22	...	...	...	18 35	...	6·38	7 7 7	
281	Ditto (C.Q.M.E.)	Lake's Creek	13·55	...	...	...	15·08	...	5·58	6 6 1	
360	Ditto (N.Q.M.E., Alligator Creek)	C.S.R. Co., Brisbane	6·48	...	...	...	14·96	...	6·46	7 8 7	
361	Ditto (N.Q.M.E., Alligator Creek)	Mourilyan Syndicate Ltd.	4·90	...	...	...	20·37	...	4·22	6 2 4	
390	Ditto (Redbank Freezing Works)	C.F.W. Rehfeldt, Atherton... ...	10·74	...	...	...	15·41	...	5·80	6 10 4	
396	Ditto (N.Q.M.E.) ...	Alligator Creek	5·70	...	...	...	17·54	...	4·47	5 17 6	
422	Ditto (Q.M.E. and A.)...	Brisbane...	8·86	...	..	...	14·15	...	5·46	6 1 7	
461	Ditto (Baynes Bros., Brisbane)	A. Ludeke, Beenleigh	4·02	...	..	...	19·23	...	5·12	6 11 11	
2057	Ditto	Gladstone Meat Works	7·60	...	...	...	12·32	...	6·69	6 13 11	
2118	Ditto	Q.M.E. and A. Co., Ltd., Brisbane	2·85	...	...	...	15·79	...	5·72	6 10 6	
2372	Ditto	J. C. Hutton Propy., Ltd., Brisbane	13·22	1 62	...	8·30	9·92	...	7·26	6 18 8	
2423	Ditto	Q.M.E. and A. Co., Ltd., Ross River	10·22	...	...	...	14·78	...	5·96	6 10 10	
2497	Ditto	Borthwick and Sons, Brisbane ...	6·92	...	...	...	14·65	...	5·27	6 0 7	Fat, 15·36 per cent.
101	Ditto (Hashmagandy) ...	Bowen Meat Works	9·00	...	...	...	24·20	...	2·98	5 15 11	
230	Ditto	Australian Estates and Mortgage Co., Brisbane	...	...	...	..	22·02	...	3·23	5 11 5	

Superphosphates and Basic Slags.

299	Superphosphate No. 1. (Hasell's)	Redmond Bros., Bundaberg ...	6·00	18·51	2·14	20·65	...	...	5 3 7	
311	Ditto (Shirley's) ..	Paul and Gray, Brisbane	7·60	18·38	2·34	20·72	...	...	5 3 6	
310	Ditto (Cross Concentrated)	Petersen, ditto	14·34	15·41	2·39	17·80	...	...	4 8 1	
340	Ditto (Shirley's) ...	Paul and Gray, ditto	14·06	19·10	2·58	21·68	...	...	5 8 0	
352	Ditto (Cross Concentrated)	Webster and Co., ditto	13·04	16·42	3·86	20·28	...	...	4 17 10	
296	Ditto A1 (Hassell's) ...	Redmond Bros., Bundaberg ...	6·40	18·40	2·33	20·73	...	...	5 3 7	
351	Basic Slag	Webster and Co., Brisbane	0·26	...	2·37 / 8·85	11·22	...	...	2 6 0	64·4 per cent. fine.

Mixed Fertilisers.

343	Shirley's No. 0	Paul and Gray, Brisbane	1·36	Nil	7·81 / 9·08	16·89	6·66	2·88	6 16 10	
270	Ditto No. 3	Campbell and Amos, Bundaberg ...	6·70	13·61	1·71	15·32	2·42	3·37	6 17 8	
344	Ditto No 5	Paul and Gray, Brisbane	6·78	12·74	1·89	11·63	6·87	3·34	7 18 10	
199	Ditto No. 5	R. B. Lawson, Stanthorpe	4·60	12·88	1·14	14·02	6·64	3·30	7 15 5	
258	Ditto No. 5	Fearnley and Co., Cairns	4·62	12·73	·86	13·56	7·08	2·98	7 11 6	
309	Ditto No. 5	Petersen, Brisbane	7·82	11·90	·27	12·17	6·90	3·23	7 7 11	
268	Ditto No. 5	Campbell and Amos, Bundaberg ...	5·36	12·86	1·88	14·74	6·63	3·17	7 15 8	
259	Ditto No. 9	Fearnley and Co., Cairns	·74	5·92	·26	6·18	4·25	3·59	5 7 4	
345	Ditto No. 9	Paul and Gray, Brisbane	5·68	5·53	·53	6·06	4·06	3·83	5 8 5	
263	Ditto No. 11	Campbell and Amos, Bundaberg ...	5·60	11·12	·40	11·52	6·80	Nil	4 17 0	
198	Ditto No. 11	R. B. Lawson, Stanthorpe	6·16	11·04	·47	11·51	6·74	Nil	4 16 7	
346	Ditto No. 11	Paul and Gray, Brisbane	8·38	10·32	1·30	11·62	7·95	Nil	5 1 10	
261	Ditto No. 14	Campbell and Amos, Bundaberg ...	2·78	5·03	8·65 / 4·74	18·42	6·60	2.50	7 7 10	
219	Ditto Garden Fertiliser	Grain Exchange, Toowoomba ...	1·60	5·92	1·29	7·21	4·15	3·93	5 14 10	
282	Yates's Plant Food	Burns, Twigg, Rockhampton ...	4·80	11·40	·29	11·69	4·70	3·33	6 14 10	
347	Shirley's Special Mixture ...	Paul and Gray, Brisbane	·92	3·63	2·16	5·79	9·08	10·52	11 8 1	
354	Cereal Guano...	Webster and Co., Brisbane	10·22	8·04	5·04	13·08	2·10	3·23	5 15 7	
397	Ditto	Cribb and Foote, Ipswich	11·00	8·01	5·00	13·01	2·18	3·54	6 0 4	
260	Shirley's £ s. d.	Campbell and Amos, Bundaberg ...	·88	6·12	·24	6·36	7·64	7·37	9 1 8	
348	Ditto	Paul and Gray, Brisbane	2·28	6·43	·81	7·24	7·60	8·14	9 16 0	
362	Ditto	C.S.R. Co., Brisbane...	4·50	5·74	·31	6·05	9·46	6·40	8 15 10	
298	No. 1 Potato Manure (Hasell's)	Redmond Brothers, Bundaberg ...	6·54	10·11	·84	10·95	5·88	3·69	7 1 5	
303	No. 1 Sugar Cane Manure (Hasell's)	Ditto ditto	1·58	2·97	2·67	5·64	7·04	8·32	9 2 10	
297	Maize Manure (Hasell's) ...	Ditto ditto	9·14	16·01	·59	16·60	5·44	2·46	7 11 5	
300	Banana Manure (Hasell's)...	Ditto ditto	2·98	3·85	1·39	5·24	27·92	1·99	10 9 11	N as Nitrate Nitrogen
306	Easterby's Cane Mixture (Hasell's)	Ditto ditto	2·50	5·56	2·40	7·96	6·76	8·04	9 10 2	
307	A1 Sugar Cane Mixture (Hasell's)	Ditto ditto	3·60	4·08	·17	4·25	10·41	11·65	12 8 1	
308	Guano (Hasell's)	Ditto ditto	19·98	...	8·47	8·47	1·74	3·75	4 9 5	
294	Pineapple and Strawberry Manure (Hasell's)	Ditto ditto	7·30	5·49	1·92	7·41	9·95	5·27	8 13 8	N as Nitrate Nitrogen.

ANALYSES OF FERTILISERS—*continued.*

Lab. No.	Fertiliser.	Where Obtained.	Moisture.	Phosphoric Acid P_2O_5. Water Soluble.	Citrate Soluble.	Citrate Insoluble.	Total.	Potash, K_2O.	Nitrogen, N.	Comparative Manurial Value per Ton.	Lime.	Magnesia.
			%	%	%	%	%	%	%	£ s. d.	%	%
	Miscellaneous Fertilising Substances.											
	Molasses	...	20·00	...	...	·22	...	3·85	·73	1 12 5	1·28	·45
	Sea Weed	...	6·15	...	...	·18	...	·40	·32	1 7 2	2·76	...
	Ash of Lantana	...	...	...	...	3·57	...	13·96	...	4 4 1	16·95	4·39
	Ditto Belar	...	...	...	...	·02	...	4·95	...	1 6 1	49·10	·84
	Ditto Gidyea	...	...	...	...	·90	...	1·10	...	0 8 6	48·70	1·52
	Ditto Brigalow	...	...	...	...	...	...	·69	...	0 3 5	54·40	1·61
	Ditto Apple-tree	...	...	...	...	·34	...	4·45	..	1 5 6	29·65	8·05
	Ditto Tobacco (Queensland)	...	...	...	...	5·36	...	27·05	...	8 4 10	40·70	14·32
	Ditto Pineapple Plants ...	...	...	...	...	5·88	...	15·02	...	5 0 3	7·20	4·60
	Ditto Grape Marc ...	...	...	...	...	10·45	...	23·62	...	8 1 4	6·62	2·12
	Ditto Bottle-tree	...	...	...	...	·24	...	29·02	...	8 0 4	23·48	13·35
	Ditto Banana Plants ...	...	...	...	...	1·46	...	36·64	...	10 5 11	21·32	7·02
	Ditto Coffee Berry Pulp ...	...	...	...	...	7·84	...	54·64	...	16 4 0	6·94	14·75
	Ditto Sisal Hemp	...	...	...	...	4·60	...	8·00	...	2 7 10	31·86	21·31
	Ditto Cane Tops	...	...	...	...	4·90	...	6·49	...	2 10 5	4·78	4·96
	Ditto Cane Trash	...	...	...	...	3·20	...	4·90	...	1 16 7	4·00	2·60

Animal Pathology.

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FURTHER OBSERVATIONS ON ONCHOCERCA GIBSONI, THE CAUSE OF WORM-NODULES IN CATTLE.

By J. A. GILRUTH, D.V.Sc., M.R.C.V.S., Etc., and GEORGINA SWEET, D.Sc.

[Read 14th March, 1912.]

Since the publication last year by the Commonwealth of Australia of our previous paper on *Onchocerca gibsoni,* several lines of external evidence have become available, bearing on the original home and host, the history of its occurrence and geographical distribution in Australia, and the means of transmission of this parasite, &c., so that it seems desirable that the information should be made public, together with a record of the results of series of experiments undertaken to elucidate the life history.

HISTORICAL.

Evidence obtained by J.A.G. during the late expedition to the Northern Territory most strongly corroborates previous statements by others and ourselves that there is a gradually increasing extent of infection by *Onchocerca gibsoni,* the further north the cattle are reared—that is, the further away from the ordinary ports of stock introduction in the south and east. From the information available at the time of their writing (1910, p. 99) Doctors Cleland and Johnston considered that the buffalo, imported into Australia from Timor in 1826-8, was the originating host, though, as shown by ourselves later (1911, pp 2 and 34), it was at least highly likely that the Timor cattle imported about 1824 and 1840 into the Port Essington Settlement were the true original hosts. However, an opportunity was available to J.A.G. of examining a number of buffalo, the descendants of those introduced by Sir Gordon Bremmer in 1824 to Port Dundas, and later to the mainland. These have spread from Port Essington southwards over the swampy plains to very near Port Darwin. These buffalo, so far as his experience goes, are all unaffected with *Onchocerca,* but all the cattle depastured on the same country are more or less affected—indeed, the greatest extent of infection yet seen was in a steer killed at Port Darwin, the region of the brisket showing at least 100 nodules—so that, although experience is limited as regards the buffalo, it seems almost certain that, had the buffalo imported at the early dates given above been the original and natural hosts, their descendants would be at least as badly affected as the cattle, if not more affected. Were these " worm nodules" at all prevalent in buffaloes, it is certain their presence would be known to some of the buffalo hunters, who invariably remove the briskets along with other parts of the flesh for food.

During the last thirty years 100,000 buffalo hides have been exported from Darwin, so that it is unreasonable to suppose that the parasitic nodules would have been entirely overlooked in all these animals. Certainly the Indian Ghi buffalo, imported about 1886 by the South Australian Government to Port Darwin itself, cannot be responsible for the original introduction of this parasite to Australia, for, even were these nodules known in them, such nodules had been discovered in Australian cattle long before this. Further inquiries, however, elicited the fact that cattle have been imported from a different source altogether. Captain Everard Home, writing from H.M.S. "North Star," 19th April, 1843, reported to the British Government in a despatch on the Port Essington Settlement, among other things, that there were at that date "1 English cow and a bull, and 2 Indian heifers and 2 cows. . . . besides 6 working oxen and 30 buffaloes." Further, numbers of careful observers among those who hunt buffalo on the Coburg Peninsula are positive that the descendants of these Indian cattle are still there, though, unlike the buffalo, they have not spread across the swampy plains down to the cattle station country. But it seems at least highly probable that they were responsible for the introduction of *Onchocerca*, not only from a comparison of the date of their entry, and that of the discovery of the nodules in Australian cattle and the wide distribution of the parasite, but also in the light of a well-considered statement by Mr S. L. Symonds, Government Veterinarian of the Federated Malay States, that the only animal in which he has ever found the *Onchocerca* nodules in those States was an old Indian bullock, the native animals and the buffalo being free.

It must be realised, however, that, if the intermediate host of *Onchocerca gibsoni* be a tick, as some have suggested, or a louse, as we ourselves suggested, and considered very probable from general evidence in our previous paper, since these ecto-parasites can only be conveyed any distance by means of their hosts, the ancestors of the Indian cattle now on the Coburg Peninsula could not be incriminated, for, as already stated, these cattle have never become mixed with the station herds. Assuming, however, some blood-sucking insect such as a biting-fly to be the intermediary host, then the possibilities of transference over considerable distances must be admitted. A thorough investigation of the descendants of the Indian and British cattle now on Coburg Peninsula will therefore prove extremely interesting, and it was a matter of great regret that, owing to absence of transport, it was impossible to make such an examination as was intended. It is hoped, however, that at an early date such an opportunity may present itself to test the infection or otherwise of these Indian and British cattle. In view of the statement recently made to us by Dr. de Blieck, Director of the Veterinary Laboratory and Veterinary School at Buitenzorg (Java), that tumours similar to those of *Onchocerca gibsoni* are quite common in Java cattle, it may yet be found that our original inference was correct—viz., that the Timor cattle, introduced some time between 1824 and 1840 into Port Essington, were the responsible agents of introduction.

The importation of Javan native cattle to Port Darwin in 1872, which, as is shown elsewhere, is considered to have been the source of the

introduction of the cattle tick (*Boophilus annulatus* var. *microplus*) and of tick fever, may also have introduced the "worm-nodules," yet they could hardly have been the first source of introduction, seeing we have circumstantial evidence of the appearance of these nodules in Queensland at least forty years ago. It may be noted, however, that the crossbred descendants of those Brahma cattle, when examined, all show more or less *Onchocerca* infection.

GENERAL CHARACTERS OF THE NODULES.

In some animals recently examined *post-mortem*, the proportion of nodules situated in the deep pectoral muscles was much less than had previously been noted, while in the thigh they were very few in number, and then were situated close alongside the head of the femur. In each case they were more numerous on the right side than on the left. Two cases are here given of two cows from the same district in North Queensland, and kept here under exactly similar conditions (*vide infra*) for six and eight months respectively, B having been killed two months later than A.

	(A 5-year-old cow).	(B 3-year-old cow.
Total number of nodules	47 (19L, 28R)	15 (6L, 9R)
Number of nodules in thigh ..	0	3 (1L, 2R)
Number of nodules containing eggs and living larvæ ..	22	4
Number of nodules containing intraparasitic parasites ..	10	4
Number of nodules degenerate ..	15	11

The proportion of nodules in B, containing degenerate parasites, is more typical than in A, and undoubtedly a marked diminution in size of the nodules took place during the months the cows were under constant observation, as determined by frequent manipulation.

We have previously noted the fact that, amongst the large number of nodules which we have examined, the female parasite was either in a stage of complete development liberating living larvæ or the nodules contained degenerated parasites; in other words, no immature parasite has ever been found in a nodule. With these two cows for a period of six and eight months there was absolutely no possibility of reinfection. Many of the nodules could be felt under the skin; and as a number of these subcutaneous nodules were found *post-mortem* to contain living *Onchocerca* liberating living larvæ, it must be assumed that they had been continuously liberating such larvæ during the whole period; for, as the male lies continuously alongside the female, there is probably continuance fertilisation of the latter.

We have in the previous paper indicated the probability that infection of the bovine takes place during its early years (first and second) alone. Corroboration of this was obtained by J.A.G. and Dr. Breinl when in the Northern Territory; on one station, the station on which the steer with

a hundred nodules had been bred and fattened, an opportunity was obtained of carefully examining two very old bullocks. In one, only one small nodule, and that containing a living parasite, could be discovered; in the other, a few small, circumscribed, thin, circular or oval dense fibrous masses about ½ in. to ¾ in. were found adhering firmly to the muscular fascia. Section showed a calcareous centre. Judging from the invariable infection with living *Onchocerca* of younger cattle on this station, two conclusions seem fairly obvious—first, there is little, if any, reinfection after a certain age; and, second, the tendency is for the nodules to become greatly diminished and ultimately disappear.

INTERMEDIARY HOST.

As indicated, in our previous communication, there are several possibilities with regard to the intermediate host, which we have already shown must be present, though, as there stated, the evidence then available appeared to point to a biting insect, and especially the louse, as being the responsible agent.

Since then, experiments at that time in progress have been completed, the investigations in the Northern Territory above referred to have been made, and several other series of experiments have been carried out with the object of testing conclusively whether the infection may be brought about by direct contact, by intermediation of the soil, or by either of the lice normal to the cow, and as to whether, perchance, an adult worm or the larvæ may leave a nodule and infect the same or other animal, thus rendering an intermediary host unnecessary.

1.—Direct Infection.

To test so far as possible whether any intermediate host be necessary, a well-formed nodule containing a living parasite was removed from a cow containing a fair number of nodules, and transplanted, under all proper conditions of asepsis, &c., to the cubcutaneous tissue behind the shoulder of a calf born and reared at the Institute. Eight months later this animal was killed. The nodule was found firmly adherent to the skin, flattened and somewhat smaller in diameter than previously, and surrounded by an intimate capsule of diffuse new connective tissue, which covered it so effectually that it would have been quite overlooked had not the exact spot of the transplantation been known. The parasite was dead, and calcified in pinhead areas. Evidently, therefore, as might be expected, the parasite will not live in other than the individual host in which it has developed, and probably cannot leave the nodule once the latter is formed, and so reinfect the same animal or pass out and infect another; also, the larvæ from this living nodule had every opportunity and sufficient time to infect the new host, and to form nodules, since well-formed nodules have been found in six to eight months old calves, so that any possibility of direct infection without the intermediation of another host is negatived, as one would have expected.

2.—Intermediation of Soil.

A quantity of earth from a cowyard in North Queensland, wherein badly-infected cows rested every night, was imported here. It was examined very carefully for any sign of larvæ or adult *Onchocerca,* both before and after moistening, and after incubating for some days, with negative results.

The soil was spread evenly over a deep layer of ordinary soil in a pen in which a young locally-bred calf was placed. The pen was a warm one, and the soil was kept moist for some time after deposition. Seven months afterwards, the calf was killed and most carefully examined, and showed no trace of nodules, or of adult parasites in any part of the body, or of larvæ either in the blood or in the subcutaneous areolar tissue, glands, muscles, or intermuscular tissue of the brisket; so that, at all events in this case, where all the conditions were as favourable as they could possibly be, infection by intermediation of the soil alone is absolutely negatived.

3.—Intermediation of the Louse and Infection by Direct Contact.

A calf referred to in the previous paper, to which lice had been artificially transferred after being allowed to feed on a restricted area inoculated with numerous larvæ, died some nine months after transference of the lice, but showed no sign of nodules either in the brisket or on the thigh, and no filarial parasites at all

Two cows, each containing a considerable number of nodules, were imported to Melbourne from North Queensland, and placed in two separate pens. They were examined very carefully at different times on and after arrival for ecto-parasites, with negative results. A locally-bred six-months-old calf was placed with each cow, each calf carrying numbers of *Trichodectes scalaris* (*Haematopinus vituli* and *H. eurysternus* not being then available), these being also found later on the cows. A large number of *H. vituli* and some *H. eurysternus,* and a large quantity of their eggs were later placed on each cow, especially just over the nodule region. Large numbers of each kind of louse were examined for larvæ up to and about five weeks after they had been placed on the cows, and at intervals later, but always with negative results. That the worms in some at least of the nodules were living was shown on arrival by excision of one of a large group lying under the skin, living larvæ and eggs being numerous. The blood of the animal was examined during the operation, but no larvæ could be detected. Nor were any larvæ or intra-parasitic parasites found in the sediment in saline fluid in which this living nodule had been kept at blood heat for some time.

Fluid, aspirated after several blisterings in various ways, was examined at different times after the œdema had been produced, both on the same day and on the succeeding day, but in no case were larvæ to be found.

Further numerous examinations were made of the blood at all hours of the day and night for larvæ, but none could be found even after

considerable quantities had been centrifuged, and a very large number of smears, both thick and thin, examined in many ways.

It is well to remember that embryos of *Onchocerca volvulus,* which forms similar subcutaneous humours in natives in West Africa, have not yet been found in the blood of infected natives; as Brumpt (p. 457) very naturally suggests, they may in that case pass into the blood intermittently, or at certain times when the patient has not been examined.

As stated above, we (and we believe others also) have made exhaustive examinations at all hours of the day and night. There is, however, one possibility. Lingard (p. 22) has found in the blood of horses in India, affected by *Filaria equina* (?) and *Filaria* sp., that comparatively few embryos are present in the blood between July and September, and may be even absent after that date. They were more numerous between December and June, being most generally present from April to September, during the hot and rainy seasons. This supports the suggestion we have already made to the effect that a seasonal periodicity may be found in *O. gibsoni.*

After an interval of five months, the calf in one of the pens mentioned above was killed (as the result of an accident), and showed no sign of *Onchocerca* anywhere. Two months later the other calf, which had been in habitual contact with the second cow, was killed, and also showed no evidence of either free *Onchocerca* or of nodules.

From these experiments, therefore, one may infer that neither direct contact nor apparently the intermediation of *Haematopinus vituli* or *H. eurysternus* or *Trichodectes scalaris* (though this latter would hardly be expected to act as such an agent) can act as a means of transmission of *Onchocerca gibsoni.*

This apparent failure of direct contact and of the louse to act as intermediary agencies in the spread of *O. gibsoni* is extremely interesting in the light of what has been stated earlier in this paper concerning probable introduction of the parasite in Indian cattle since, as there stated, distribution from the Indian cattle originally introduced, if they were the original hosts, could hardly have taken place other than through the agency of a flying and biting insect, though there are, as pointed out in our previous paper (p. 27), several difficulties in respect to this means of transmission.

As regards the apparent absence of embryos from the blood, and the suggested impossibility of transmission, therefore, by a blood-sucking insect, we may note that Brumpt (p. 457) does not hesitate to suggest in the exactly similar case of *O. volvulus* that a specific fly (*Glossina palpalis*) is the distributing agent.

It may be remarked that proof of the intermediation of any flying insect will be impossible without rigorous methods of experimentation, and even then will be extremely difficult. So numerous are the native animals, birds, and marsupials, carrying microfilaria in their blood-streams, that only insects bred in a laboratory can be used, and they must

be forms belonging to the North of Australia, since those found in the Southern States are possibly impotent in this respect, while for this and other reasons, including climatic conditions, the experiments must be done in the North, with cattle bred preferably in Tasmania, so as to avoid all possible infection previous to experimentation. The practicability of, and arrangements for, experiments along these lines are now under consideration, and facilities for the same have been asked for from the Federal Government.

From the scientific point of view it is undoubtedly true that complete proof as to the intermediate host would be valuable, but from the practical point of view we do not anticipate that the results would be of any material value. We have shown that every probability points to the intermediary host being a fly; we have also shown previously that in the Northern parts of Australia all cattle are more or less affected. When one reflects, therefore, that over the greater part of Northern Australia where worm-nodules are prevalent there are no fences, that the cattle on the average do not nearly number 1 per 100 acres (often over large areas not 1 per 1,000 acres), and the impossibility of coping effectually with tick fever in such countries where the intermediary host (the tick) is well known and cannot fly, the remoteness of practical means of prevention is evident.

In contradiction, it may be urged that certain biting insects have been eliminated from certain districts in the world; but these have been insects restricted to certain habitats, such as watercourses, &c., and we have previously shown that cattle from the driest areas are often as seriously affected as cattle from wet districts, and that even areas chiefly supplied by artesian water are not by any means immune. Nor so far as is yet determined by the evidence available at freezing works, &c., is there any natural circumstance other than latitude which specially favours infection.

This does not mean that we suggest that scientific investigation should be discontinued, but that the stockowner and exporter can hardly expect an extermination of the parasite.

We desire to thank Dr. W. Stapley, Mr. Norman MacDonald, and Mr. H. R. Seddon, all of the Melbourne University Veterinary Institute, for their assistance at various times in the above experiments.

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General Notes.

THE BENEFIT OF APPLE EATING.

Apple eating is very beneficial to health. Apples are very nutritious, for they contain more phosphoric acid than any other fruit or vegetable. If eaten before retiring, the brain and liver are benefited; undisturbed sleep is promoted; the odour of the mouth is disinfected; the superfluous acids of the stomach are restrained; hemorrhoidal disturbances are paralysed; secretion of the kidneys is accelerated, and the formation of stone is prevented.

IF YOUR CLOTHES CATCH FIRE.

Do not run about and scream, but sink on the floor and roll yourself up in a hearthrug, if there is one, or the flames can often be crushed out at once against the floor, and no further harm incurred than burnt hands. If you see a child or anyone else with their clothes on fire, seize the first heavy woollen thing that comes to hand—a blanket, rug, tablecloth, or thick coat. Throw it round the person, drag her or him to the ground, and crush the fire out. Many of the deaths from burning so often reported would never occur if proper steps were taken immediately to extinguish the flames. It is fatal to move about, for the least current of air will increase the fire.

OILSKIN CLOTHING.

A correspondent of "Garden and Field" writes:—"In the current issue you have an excellent method given on the preparation of oilskin clothing. Would you pardon a suggestion from me which I think would be an improvement? I refer to that portion dealing with the sticking. If it is made with boiled oil it will stick beyond a doubt. A most simple way to overcome it is the following:—After the last coat is applied and perfectly dry, then immerse in a bath of clean cold water for three days. Then remove and dry in shade. Then apply some warmed vaseline, with a soft rag, working in well, especially where most friction occurs, such as the elbows and shoulders. This I tried myself, and found it by far the best method."

THE JERUSALEM ARTICHOKE.

Though this is an excellent and easily-grown vegetable, yet, strange to say, it is only cultivated to a very limited extent in the Australian States. It is a very hardy plant, and may be cultivated successfully in any fairly good soil in all excepting the most arid regions. It thrives,

however, to the greatest perfection in moderately rich, sandy loam, with a moderate amount of moisture. Though the favourable conditions for cultivating this vegetable exist in most gardens, yet in many it is never seen. It is true it may be obtained in the principal vegetable markets, but in limited quantities, and at prices that only few can afford to give. As compared with the potato, the Jerusalem artichoke yields about double the quantity of nutritive matter—in fact, its value as a food is equal to the cereal grains. Another advantage possessed by this vegetable is that it is more easily digested and not so liable to cause flatulency as the potato, and consequently may be eaten safely by delicate persons. Independent of its value as a vegetable, the Jerusalem artichoke is an excellent and profitable crop for feeding swine, which thrive remarkably well upon the tubers. When grown for this purpose, when the crop is mature and the pigs are ready for fattening, turn them in and let them root up the tubers. Not the least recommendation is the prolificness of this plant when growing under ordinary favourable conditions.—"Exchange."

Answers to Correspondents.

DIPS AND SPRAYS.

"Dip," Degilbo—

The Department of Agriculture and Stock has prepared a pamphlet on the subject of dips and their construction, together with directions for the preparation of dip fluids, which can be obtained free of charge from the Department. The method of finding the content in gallons of a dip is also given.

FEED VALUE OF WHEAT STRAW AS COMPARED WITH LUCERNE.

Mr. W. J. Brünnich, Agricultural Chemist, says that it is impossible to make an accurate comparison of the monetary value of lucerne and wheat straw. With regard to total dry matter and amounts of carbohydrates (fibre, &c.), lucerne and wheat straw are of equal value, but, with regard to nitrogenous matter (proteins), 20 lb. of lucerne hay are as good as 620 lb. of wheat straw, or, with lucerne at £3 per ton, the wheat straw is only worth 2s. per ton, if value is based on proteins alone.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR OCTOBER, 1912.

Article.		OCTOBER. Prices.
Bacon, Pineapple	lb.	8½d. to 10d.
Bran	ton	£6 15s.
Butter	cwt.	110s.
Chaff, Mixed	ton	£7 to £7 10s.
Chaff, Oaten (Victorian)	"	£7 15s.
Chaff, Oaten	"	£7 15s.
Chaff, Lucerne	"	£6
Cheese	lb.	8d. to 8½d.
Flour	ton	£10
Hay, Oaten (Victorian)	"	£9
Hay, Lucerne	"	£5 5s.
Honey	lb.	2d. to 2½d.
Maize	bush.	4s. 6d. to 5s.
Oats	"	4s. 6d.
Pollard	ton	£7
Potatoes	"	£21 to £23
Potatoes, Sweet	cwt.	7s. to 9s. 1d.
Pumpkins	ton	£3 to £3 10s.
Wheat, Milling	bush.	5s. 1d. to 5s. 4d.
Onions	ton	£21
Hams	lb.	1s. 1½d.
Eggs	doz.	9½d. to 10½d.
Fowls	pair	3s. 9d. to 5s. 6d.
Geese	"	5s. 6d. to 8s.
Ducks, English	"	5s. 6d.
Ducks, Muscovy	"	6s. to 6s. 6d.
Turkeys (Hens)	"	8s to 10s.
Turkeys (Gobblers)	"	17s. to 25s.

SOUTHERN FRUIT MARKETS.

Apples (Choice), per case	5s. to 8s.
Apples (Cooking), per case	3s. to 6s.
Bananas (Fiji), G.M., per bunch	2s. 6d. to 8s. 6d.
Bananas (Fiji), G.M., per case	8s. 6d. to 17s.
Bananas (Queensland), per bunch	1s. 6d. to 4s. 6d.
Bananas (Queensland) per case	12s. to 13s.
Custard Apples (Queensland), per quarter-case	5s. to 8s.
Lemons (local), per gin case	4s. to 7s.
Mandarins (Emperors), per case	5s. to 13s.
Oranges (Navels), per case	10s. to 20s.
Oranges (other), per case	10s. to 11s.
Passion Fruit, per half-case	3s. to 7s.
Peanuts, per lb.	5½d.
Pineapples (Queensland), common, per case	3s. 6d. to 7s. 6d.
Pineapples (Queensland), Ripley's, per case	3s. 6d. to 7s. 6d.
Pineapples (Queensland), Queen's, per case	6s. 6d. to 7s. 6d.
Plums, per half-case	...
Quinces, per gin case	..
Tomatoes, per half-case	3s. to 5s.
Cucumbers (Queensland), per bushel case	5s. to 7s. 6d.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Article.	OCTOBER.
	Prices.
Apples (Eating), per case	7s. to 15s.
Apples (Cooking), per case	6s. to 10s. 6d.
Bananas (Cavendish), per dozen	2d. to 4½d.
Bananas (Sugar), per dozen	2d. to 3d.
Cape Gooseberries, per quarter-case	5s. to 8s. 6d.
Cherries, per quarter-case	...
Citrons, per cwt.	12s.
Custard Apples, per quarter-case	4s. to 5s.
Lemons, per case	5s. to 7s.
Mandarins, per case	5s. to 8s.
Mangoes, per case	8s. to 10s.
Oranges (Navel), per case	5s. to 12s.
Oranges (Other), per case	5s. to 12s.
Papaw Apples, per quarter-case	1s. to 1s. 9d.
Passion Fruit, per quarter-case	4s. to 5s.
Peanuts, per lb.	3d. to 4d.
Pineapples (Ripley), per dozen	5s. to 7s.
Pineapples (Rough), per dozen	4s. 6d. to 5s.
Pineapples (Smooth), per dozen	4s. 6d. to 5s.
Rockmelons, per doz.	...
Strawberries, per dozen pint boxes	4s. to 6s.
Tomatoes, per quarter-case	2s. 6d. to 6s.
Watermelons, per doz.	...

TOP PRICES, ENOGGERA YARDS, SEPTEMBER, 1912.

Animal.	SEPTEMBER.
	Prices.
Bullocks	£9 to £11 2s. 6d.
,, (Single)	...
Cows	£7 10s. to £8 15s.
Merino Wethers	29s. 3d.
Crossbred Wethers	27s.
Merino Ewes	18s. 9d.
Crossbred Ewes	21s. 6d.
Lincoln Ewes	19s.
Shropshire Ewes	19s.
Lambs	18s.

Farm and Garden Notes for December.

FIELD.—The grain harvest will be now nearing completion, and to all appearance the results are likely to constitute a record, notwithstanding the dry spell of September and October, and the yield promises to be very satisfactory to the wheat-growers. The principal factor operating against a still greater extension of the wheat-growing industry is, that many farmers who formerly grew wheat and barley have turned their attention to dairying, which offers larger and quicker returns.

The dry weather which prevailed during parts of the month of September and October gave rise to grave fears for the harvest, but the subsequent timely rainfall came just in time to save the crop. The estimates of the probable yield have varied so considerably that it will be well to wait until the harvest is over before calculating on the result.

Given favourable weather, maize, panicum, imphee, Kafir corn, and sorghum may be sown. Arrowroot, ginger, and sweet potatoes may be sown.

KITCHN GARDEN.—Gather cucumbers, melons, vegetable marrows, and French beans as soon as they are fit for use. Even if they are not required, still they should be gathered, otherwise the plants will leave off bearing. Seeds of all these may be sown for a succession. Tomatoes should be in full bearing, and the plants should be securely trained on trellises or stakes. Take up onions, and spread them out thinly on the barn floor until the tops wither sufficiently to pull off easily. They should then be graded into sizes, and sent to market or stored in a cool place. Where there is an unlimited supply of water, and where shade can be provided, lettuce and other salad plants may still be sown.

FLOWER GARDEN.—Keep the surface of the land well stirred. Do not always stir to the same depth, otherwise you are liable to form a "hard pan," or caked surface, beneath the loose soil. Alternate light with deep hoeings. A few annuals may still be planted, such as balsams, calendulas, cosmos, coreopsis, marigold, nasturtium, portulacca, zinnia, and cockscomb. Plant out whatever amaranthus may be ready. These may still be sown in boxes. Clear away all annuals which have done flowering. Bulbs should have all the dead leaves cut away, but the green leaves should not be touched. Stake chrysanthemums, and, as the flower buds develop, give them weak liquid manure. Coleus may now be planted and propagated from cuttings. Dahlias are in various stages, but the greater part will have been planted by this time. Give them liquid manure, and never let them dry up. Lift narcissus about the end of the year, but do not store them. Plant them out at once in their new positions. Top-dress all lawns.

Orchard Notes for December.

THE SOUTHERN COAST DISTRICTS.

December is somewhat of an off month for pines, though bananas should be improving both in quality and quantity. The purely tropical summer ripening fruits are not yet ready, and, consequently, there is only a limited supply of fruit in this part of Queensland during the month.

Early ripening varieties of grapes will mature, and care should be taken to market them in good order. The first fruit to ripen should be put up in small packages, as, if marketed in this manner, it will fetch a better price, but as it becomes more plentiful it can be packed in larger cases.

Pay particular attention during the month to all peaches, apples, pears, Japanese plums, or other fruits that are liable to be attacked by fruit fly, and see that no fly-infested fruits are allowed to lie about under the trees, and thus breed out a great crop of flies that will be ready to destroy the grape and mango crops as they mature.

If the month is dry see that the orchard is kept well worked so as to retain moisture in the soil, and, in any case, even should there be a good rainfall, it is necessary to cultivate in order to keep down weed growth, as if weeds are not kept in check now there is little chance of their being kept in hand once the January and February rains set in.

The planting out of pineapples, bananas, and most kinds of tropical fruits can be carried out during the month, especially if there is any rainy weather; but, if the weather is dry, it is better to defer the planting of tropical fruits till January or February.

The cyaniding of citrus trees can be continued when necessary, and where Maori or orange mite is showing it should be checked at once, as Maori fruit is of no use for the Southern markets, and is unsuitable for export to the old country.

THE TROPICAL COAST DISTRICTS.

Clean up all orchards, pineapple, and banana plantations as long as you have the chance of fine weather, so as to have your land in good order when the wet season commences, as once the rain sets in there is little chance of fighting weeds. Watch bananas carefully for fly, and market the fruit in good order. Handle the crop of pines carefully;

don't let the fruit get too ripe, as an over-ripe Northern pine is tasteless. The fruit should be cut as soon as it is fully grown, as even when quite green the rough-leafed varieties have usually developed sufficient sugar to suit most persons' taste. Pack carefully to prevent bruising, and they will carry South in good order.

Only send high-class mangoes South—bad-flavoured sorts, and stringy, carroty, or turpentine flavoured varieties are not worth shipping. High-class fruit will pay to handle carefully, but there is no demand for rubbish, and I am sorry to say that fully 90 per cent. of the mangoes grown in the State must be classed under the latter heading.

Tropical fruits of all kinds can be set out during suitable weather. Fruit pests of all sorts must be systematically fought.

THE SOUTHERN AND CENTRAL TABLELANDS.

December is a busy month for the growers in the Stanthorpe district. Early apples, plums, peaches, nectarines, &c., will ripen during the month, and must be marketed as soon as ripe, as they do not keep long once they are gathered. Handle carefully, and grade better; there is far too much early rubbish slumped on to the local markets, which tends to spoil the demand as well as the price. Watch the orchards very carefully for Codling moth and fruit fly, and take every possible precaution to keep these pests in check should they make their appearance, as the future cleanliness of the orchard depends very largely on the care that is taken now to keep these pests in check.

If the month is dry keep the orchard and vineyard well cultivated. Watch the vines carefully so as to detect the first signs of Oidium or Anthracnose, and systematically fight these pests, remembering always that in their case prevention is better than cure, and that only prompt action is of the slightest value.

On the Darling Downs every care must be taken to keep the fruit fly in check, and on no account must infested fruit be allowed to lie about under the trees, as this is far and away the best method of propagating the pest wholesale.

In the Central District the grape crop will ripen during the month. Handle the fruit carefully. Cut it when dry, and where it has to be sent long distances to market pack in 6-lb. baskets rather than in larger cases. Where dry keep the orchard and vineyard well cultivated, and where the citrus and other fruit trees require it give them an irrigation. Don't irrigate grapes once the seeds have been formed, as it tends to deteriorate the quality, and to make the fruit tender and consequently to carry badly.

Queensland Agricultural Journal

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Agriculture.

FARMYARD MANURES AND THEIR APPLICATION.

By the term "farmyard manure" is here meant all the various liquid and solid accumulation of farm and garden, having value as fertilisers, but worthless for most other uses. The term includes the excreta of animals, the litter used in connection with them, and the combination of these substances, fermented and otherwise. The farm and farmyard is by far the most important source of farm fertility. The great body of cultivators employ no other manures than those produced in the course of their own operations, whilst those farming recently-cleared scrub lands or recently-broken-up blacksoil plain lands use no manure at all, nor do they require to do so for a long time.

The farmer who finds that, under his system of management, the supply of home-made fertilisers is insufficient for the demands of the land may often, by a slight change of cropping or in the general plan of his operations, increase the available supply of manure without having to purchase elsewhere. What these changes should be depends, of course, on local conditions, but, in a general way, it may be said that the lines along which the farmer must act to increase the home supply of fertilisers are—

1. Increased attention to live stock.
2. The growth of larger supplies of stock foods for home consumption.
3. Feeding purchased foods; and
4. Laying down the land to grasses, clovers, and lucerne.

Fruitgrowers and market gardeners, who, in a majority of cases, pay high prices for city stable manure and other town refuse, would find it profitable to combine dairying and pig-raising with their chief business, and these sources of fertilisers are not at all antagonistic to either fruit-growing or market gardening. The few cows, horses, or pigs would pay for their keep even if no more than the manure could be counted as clear gain.

Professor Shelton, the first Principal of the Queensland Agricultural College, once published the following figures obtained from actual feeding experiments, and they are of much interest as showing the value of manure produced by different animals under ordinary conditions of liberal feeding:—

Animals.	Food.	Food Consumed per Animal Daily.	Manure excreted per Animal Daily.	Composition of Manure.			Value of Manure.	
				Nitrogen.	Potash.	Phosphoric Acid.	Per Ton (2,240 lb.)	Per Animal Daily.
		Lb.	Lb.	Per cent.	Per cent.	Per cent.	s. d.	d.
Cows ..	Hay, silage, beets, wheat, bran, corn meal, cotton-seed meal, malt, sprouts	75·5	81·5	0·50	0·29	0·45	11 1	4½
Horses (at work)	Hay and oats (estimated ⅗ manure collected)	..	52·5	0·47	0·94	0·39	12 9	3½
Sheep ..	Grain, beets, and hay	5·3	7·2	1·00	1·21	0·08	19 6	0¾
Swine ..	Corn meal, or corn meal and flesh meal	3·6	3·5	0·83	0·61	0·04	14 10	0¼

These facts, showing, as they do, the important relation which live stock sustain to farm fertility, indicate clearly the means by which poor Queensland soils may be made better and the rich soils kept up to a high average of cropping power. If it be said that much, particularly of the tropical farming of Queensland—canegrowing, for example—does not admit of stockkeeping as an adjunct, there is still open to these cultivators green-manuring in connection with the moderate use of purchased fertilisers, and upon every plantation there are vast possibilities of increasing the supply of manure through careful husbanding of the various odds and ends of sugar-growing—bagasse, trash, filter-press cake, the manure of working animals (many plantations stable over 100 horses), and the like, which alone will go far towards placing the plantation on an independent basis as to the manure supply. The question before canegrowers is, to-day, not what are the profits of virgin soils from cultivation alone, but how to maintain the standard of profit and the fertility of the plantation at a common and high level.

Next we come to—

The VALUE OF MANURES.

The quality of manure and its consequent value depend upon the food from which it is made, and the care taken in preserving it. The droppings of animals fed upon straw, grass, and herbage deficient in nutriment are deficient in the elements of fertility. The passage of these substances through the digestive system of the animal adds nothing to their value. Indeed, as has often been shown, the animal retains a certain and appreciable amount of the nitrogen, potash, and phosphoric acid of its food, the manure showing a corresponding loss, even where the urine has been carefully saved. The amount of these substances retained will vary considerably with animals under different treatment. Young and growing animals, milch stock, and animals gaining in flesh rapidly, will retain the largest amounts of fertilising ingredients contained in the foods. The common mistake of farmers is that all manures of a particular kind are of equal value. Stable manure, for instance, is generally valued at so much a load, although it is possible for one load to be worth four or five times as much as another. This is shown in the following table of the manurial value of a few foods, in which allowance has been made for the amount of fertilising constituents retained by the animal. The current price of commercial fertilisers is the basis of this calculation of values:—

VALUE OF MANURES FROM ONE TON OF FEED.

	£	*s.*	*d.*
Lucerne hay	2	3	9
Maize fodder	1	15	7
Oaten hay	1	13	10
Millet-setaria, green	0	13	0
Cowpea vines, green	0	10	6
Cowpea vines, hay	2	13	11
Sorghum, green	0	8	6
Barley straw	1	2	10
Oat straw	0	9	9
Wheat straw	0	15	1
Barley (grain)	2	1	10
Maize	1	15	0
Oats	1	13	3
Linseed	3	3	8
Wheat bran	3	10	9

WASTES IN MANURES.

One has but to consider the possibilities of loss in manures to see how small a portion of farm-made fertilisers is used by the farmer. In the first place, about one-half of what may be called the manurial contents of food is discharged in the liquid excrements. This is practically all lost in nearly every stable and stockyard in the State. Then, the loss from the fermentation and washing of manures piled in the

open is undoubtedly very great. It has been found by careful experiment, carried on continuously for two years, that exposed piles of manure, in the course of six months, lost fully one-half in weight and parted with about 40 per cent. of the contained nitrogen; and this has been proved at many American agricultural experiment stations. From this it would seem that the farmer who allows the urine of his animals to go to waste, and exposes the solid excrement to the weather in piles without protection for several months, has not more than 25 per cent. of the fertiliser actually available to him.

In a future article we shall deal with the preservation and methods of application of manures to the soil.

THE COWPEA AS A SEED CROP.

By G. B. BROOKS, Instructor in Agriculture.

Frequent reference has been made in the journal as to the value of the cowpea crop. Practically, the whole of the information supplied has dealt with its importance either as a green manure or as a fodder. In the present article it is intended to discuss this crop from a seed-producing point of view.

For a number of years there has been a fairly heavy demand for cowpea seed at prices varying from 10s. to 20s. per bushel. An acre of cowpeas will give, if grown under suitable conditions, a return of from 30 to 60 bushels. This, together with the fact that the crop is one easy to raise, should be of some interest to farmers, more particularly those who are just commencing operations and whose cultivation areas are somewhat limited in extent.

Its value as a soil renovator in sugar-growing districts is now well known, and its use firmly established; therefore, the demand for seed is more likely to be on the increase than otherwise.

There is also little prospect of the sugar-grower raising his own seed, for it must be borne in mind that the moist, humid conditions obtaining in the North are unsuitable for the profitable raising of the cow pea for seed purposes. The sugar-grower has, therefore, to depend upon the Southern farmers for his seed, and, lately, he has had considerable difficulty in getting his supplies. This is to be regretted, for, if unable to carry out a system of green manuring, it will very materially affect the fertility of our sugar lands and ultimately lead to decreased production.

In the raising of cowpeas for seed one fact must not be lost sight of, and that is, the variety grown must be such as will meet the requirements of the cane-grower. The principal requirement is a plant that will give a maximum amount of vine irrespective of its seeding qualities. A rather important point, however, in connection with the cowpea crop is, that, no matter what the habits of the variety, whether bush or trailing, a large development of bush or vine invariably means a light crop of pods.

It is possible, however, to induce a heavy trailing variety to produce a heavy crop of seed. The factors that have to be taken into consideration to attain this end are:—Climatic Conditions; Variety; Soil; Time and Method of Planting.

CLIMATIC CONDITIONS.

The cowpea is essentially a warm-climate crop, and grows to perfection in our coastal districts. It will be found, however, that conditions west of the Main Range are extremely suitable when the production of seed is the main object in view, the tendency to run to vine not being so great.

VARIETY.

There are some twenty distinct varieties grown in Queensland. In habit of growth, they vary greatly; some sorts are erect or bush-like, others trailing. Amongst those there are several that are eminently suitable as a smother or cover crop. The Black, Clay, Whip-Poor-Will, and Piebald are good allround sorts, and will invariably give excellent results under varying conditions of soil and climate. Others suitable, but not quite such heavy seeders, are:—Black Eye, Large, and Small Purple, Iron, and Groit.

SOIL.

This crop is not at all particular as regards soil, providing the drainage is good. For seed production a sandy loam is preferable. Too rich a soil, combined with a very favourable season, has the tendency of inducing the plant to run too much to vine. The land should be well worked; the better the cultivation, the better the crop.

METHOD AND TIME OF PLANTING.

In the raising of seed in our Southern coastal districts, planting should be carried out either early (September and October) or late (February) in the season. In dry inland districts this precaution is not necessary.

The method adopted in planting and the amount of seed used per acre have very marked effect upon the bearing capacity of the vine. The following rule is a pretty safe guide to go by: Sow thin for green manuring and thick for seed crop. Thin sowing develops a tendency on the part of the plant to run to vine. A thickly-sown crop will seldom run at all, but will develop a bush habit producing a heavy crop of pods.

Planting should be carried out in rows 2 ft. 6 in. apart in heavy and 3 ft. apart in light soils. The seed can be put in with a corn planter (fitted with plate to suit), wheat seed drill, or Planet Jr. seed drill. The seed can also be dropped by hand when cross-ploughing, or by opening up with the plough and covering with the scuffler or harrows.

After germination, the crop should be scuffled so as to promote a healthy growth and keep down weeds.

The amount of seed required to plant an acre depends upon the variety. For an average-sized sort, 10 to 12 lb. will be found sufficient.

(TO BE CONTINUED.)

THE FARMER'S SHEEP.

By W. G. BROWN, Sheep and Wool Expert.

FEEDING.

In the four numbers of this journal for the months of August, September, October, and November, was held a short discussion of the merits of the various breeds of sheep which are available to the farmer. We have chosen Lincoln on Merino as the first cross most likely to give a useful dual-purpose animal, and, if fat lambs be the desideratum, the use of either English or Border Leicester on this cross.

The selection of a proper cross is, of course, of importance; but it is not nearly as important as the provision of suitable and sufficient food for the animals. This seems obvious, yet it is common to see arrangements made that lambs shall fall within twenty-one or twenty-two weeks without the slightest provision being made for the advent of from 70 to 100 per centum increase of mouths. There is always trust in Providence; but the Society for Prevention of Cruelty to Animals have another name for trust of the kind used by improvident sheep farmers. This brings us to the discussion of the second of the four questions propounded in the August number of this journal:—"What shall they [the farmer's sheep] be fed upon?"

It has been shown that particular breeds are voracious feeders, and that the British breeds in particular will eat anything which grows in the field (if not poisonous), and thrive. It has been known for centuries that the effect of feeding sheep on cultivated land benefits the growth of crops, when they (the sheep) have been withdrawn, for at least three years. Of the total amount of fodder consumed on any given area, 90 per centum is returned to the ground in the form of valuable manure, the other 10 per centum going into the formation of mutton and the growth of wool.

Thus, while doing the labour of clearing fallows of what many farmers call rubbish, the animals return to their owner 6d. per month for wool; a similar amount in mutton and lamb; and enhance the bearing value of the field, whatever crop be sown.

Even when the crop is growing, presupposing a decent season, wheat, barley, oats, &c., may be fed down once or twice during the early stages of growth, with benefit to the yield of grain, and a much easier handling of the resultant short growth of straw. More than once I have seen farmers who, during the late season, have *borrowed* sheep for feeding down purposes. They had none of their own. It has become a settled principle in the cereal-growing districts of the South to keep sheep in conjunction with that class of crop.

In the case of a farmer whose principal work for the year lies in the production of crops for sale in the market, it is safe to say that he can run at least three-quarters of a sheep to the acre as a side-line. His flock will keep the fallows bare and free from weeds, and will require less care and labour than any other of his domestic animals.

For the farmer who makes the production of fat sheep and lambs the main object of his labours, a differing set of conditions exists. As stated in the August number of this journal, it does not pay to graze stock on natural grasses when the land costs more than £2 per acre. The sheep farmer must, therefore, cultivate, and it is on the amount of skill, knowledge, and common sense he possesses that the measure of his success depends.

The beginner has been told in these articles the proper class of sheep to grow, and an endeavour will now be made to show him what fodders are available to him on Queensland country. As pointed out in former articles, the Merino sheep is not a farmer's sheep, if kept in the pure state. It is too slow and too dainty in its food, as compared with the British breeds, which eat anything in the shape of herbage.

In comparison, however, all herbages are not equal in value for the production of wool and mutton. A very long list of good fodder plants may be successfully grown in the farming districts of Queensland, and discussion of the best known of these will help us to find those which are best in the light of our present knowledge.

High above them all is Lucerne. To the sheep farmer especially its value lies in its fattening qualities, and in the fact that, once it is planted on suitable land, it requires little labour to keep it in good order. A big proportion of the Downs is available for this plant, and a considerable area of the coastal country. Sheep may be, and in many places are, fed exclusively on it, and under the most favourable conditions as many as 75 sheep to the acre have been kept in good order for over five months in the middle of the worst drought experienced in Australia.

This was the celebrated Jemalong experiment, at Forbes, New South Wales, and it is worth while reproducing the particulars:—

"At a show of the Forbes Pastoral and Agricultural Society, in 1902 (I believe it was), Mr. N. A. Gatenby, of Jemalong Station, stated that every station, wherever sufficient water was available, should have at least 200 acres under lucerne, and would thus save at least their breeders in any drought. The Minister for Agriculture was present at the dinner, and was impressed with the statement, although it was derided by most of those present. The Minister asked Mr. Gatenby if he could prove his statement, and was answered, 'I will prove it by sustaining, in good condition, 75 sheep to the acre during a period of four months, under a test to be supervised by anyone the Minister shall select.'

"Upon this, the test was begun, an officer of the Department of Agriculture being sent from Sydney to supervise the operation. A summary of the official report runs:—

"Early in October a paddock of lucerne, 22 acres in area, was handed over for the experiment. That there had been no provision made beforehand is shown by the fact that just previously to this a flock of 550 sheep had been depastured in the paddock, and for the purpose of obtaining uniform and successive growth 10 acres of irregular herbage were cut and carted off the ground.

"Two flocks of sheep, mixed sexes and ages—one Merino, and the other Crossbred—were brought in from a back paddock, where they were existing under starving, drought conditions; 562 of each of these were put into separate paddocks of 30 acres each; and a mixed flock of the same number put into a paddock of similar area. None of these paddocks had the slightest sign of edible vegetation within their enclosures, except what was put in from time to time. The Merinos were in poor store condition, while many of the Crossbreds were so weak that they could hardly crawl. These were included in the test, because such conditioned sheep would probably be found on any station suffering from drought. All the sheep had been recently shorn by machines. In December and January, when intense heat, dust, and hot winds were the rule, the animals keenly felt the lack of shade and the inferior tank water supplied. The test paddock was divided into seven equal areas, and each made its successive growth ready for cutting in 35 days, giving about 10 to 12 tons of green food per acre. This was cut daily, and carted out to the sheep twice each day, thus giving each of the 1,685 sheep two lots of fresh green food daily. After cutting, each area, in its turn, was irrigated; and as early as possible in the day. By the time the seventh portion was cut, the first was ready again. The total loss by death was one sheep. At the end of February the sheep generally were in good health and doing well. The test bore out fully Mr. Gatenby's statement that he could feed 75 sheep to the acre on irrigated lucerne."

[A full account of the Jemalong experiment was published in the "Q.A. Journal," 1st May, 1903.—ED. "Q.A.J."]

This epoch-making experiment for the sheep world was carried out on country which Oxley saw in 1826, and reported in 1827:—"I am firmly of opinion that this land will never be fit for human occupation other than the few miserable savages who roam about its desolate surface."

In another case, sheep were pastured on irrigated lucerne to the number of 15 sheep per acre. This was at North Yanko, New South Wales, where that number was fed for the greater part of the year. In this case the lucerne was not cut, the sheep grazing on it doing their own cutting, and, incidentally, destroying much with their sharp toes.

[TO BE CONTINUED.]

RURAL HAND LABOUR AND MACHINERY.

Under the caption, "The decrease of agricultural hand labourers due to the use of machinery," the "Revue Générale Agronomique," a publication issued by the Agricultural Engineers' Institute of the University of Louvain, Belgium, writes:—

"M. W. Guisset, in his interesting communication to the Association of Agricultural Engineers of Louvain, in March, 1911, propounded the following question:—Why has the use of agricultural machinery so much

increased during the last few years? Is this due to the increasing intensity of the critical position of manual labour, or is it not rather a cause and not an effect of this crisis?

" It does not appear possible to admit the latter hypothesis. We do not share the apprehensions of the agricultural labourers in respect of constantly growing development of the machinery of the farm. On the contrary, we hold that machinery is their most valuable auxiliary, for it is to the machine that they owe, principally, the increase in their wages. It cannot be maintained that machinery has driven the agricultural labourer out of our fields. It is the result, more than anything else, of the imperative need for labour which has created the alternative means; the scarcity of labour alone has been the cause of the call for machinery. The exodus of our rural workers to the ' tentacular cities ' has forced the farmers to organise in order to meet the need, by a reduced staff, and most certainly machinery was not the prime cause, but merely the result of this abandonment of the soil; and, meanwhile, the introduction of seed drills, mowing machines, horse rakes, reapers and binders, &c., has considerably increased the productivity of labour, and wage-earners have been the first to benefit from it. Each year, marked progress has been made in our agricultural implements, and it has been shown that good progress has been made in the production due to manual labour, and a progressive rise in wages as a result.

"Nevertheless, the rural worker attributes his troubles, unreasonably, to the machines, the belief of many of them being that the labourer has been replaced by the machine. This is certainly a very regrettable misunderstanding, which would have already been cleared up if education and instruction were more universally spread in the country districts. The officials of our agricultural societies should, at their meetings, convince the rural population that agricultural machinery only appeared on the field after the departure of the labourers, and should combat most energetically the arguments of certain agitating orators, who never fail to exploit to their personal profit these facts, at the same time confusing intentionally cause and effect.

" It is incontestable that manual labour in agriculture is without question of better quality than work done mechanically, were it only because in manual work the intelligence of the worker always directs the energy he develops, and husbands the strength according to the necessity of the work.

" It is also certain that manual work results, by forming a uniform soil surface, in an increased production; a gardener, by the careful working of his bed, gets results which, if reckoned by acres, would represent enormous figures. But the actual cost of hand labour, considered in the light of acres, would not be recouped by the sale of the produce at ordinary market prices.

" Consequently, the development of our primary industries compels us to perfect and carry out unceasingly the mechanical working of the land. Thus, the present-day farmer is obliged to sacrifice the quality of the work, in order to realise the great quantity demanded by the improvement of his farm.

"He has partially replaced human energy by the cheaper energy of horse-power motors; then, by force of circumstances, he has had to substitute inanimate machines, from which he demands a thousand times more energy at a still cheaper rate."

SWEET POTATOES.

In the issue of this journal for July, 1912, there appeared an article on "The Propagation and Breeding-up of a Good Class of Sweet Potato," by Mr. G. Brooks, Instructor in Agriculture. By the unfortunate omission of a "full stop" (decimal point) it appeared that young bulbs should be covered to a depth of 10 inches, whereas the depth should have been shown to be 1·0—*i.e.*, 1 inch. Sweet potato growers would, of course, at once detect the mistake; but those who have not had experience in this crop would naturally take the supposed statement of the Agricultural Expert as correct. The depth to which the young tubers should be covered is 1 inch.

WATER SUPPLY TO FARMS.

THE COLLECTION AND STORAGE OF RAINFALL.

BY ARTHUR MORRY, Surveyor, Department of Agriculture and Stock.

[CONTINUED FROM OCTOBER ISSUE.]

The storage of rainfall for the domestic purposes of the farm cannot be neglected, for, however important it may be to secure a copious supply for animals by means of dams and reservoirs, it is equally important to collect and store for domestic and daily use.

The great waste of water from roofs is often the result of lack of knowledge as to how to estimate the quantity likely to fall on these collecting areas. Rainfall is very erratic. During some months there is an abundance and to spare; then, again, several months pass by without any appreciable precipitation. How can we estimate the possible flow from roofs, and so make provision for storing the great bulk of it? Every farmer can ascertain, if he wishes, the average annual rainfall of his district, and it then becomes simply a matter of calculation as to how much water he may be able to collect from his roof areas.

It is known that 1 inch of rainfall per hour will cause a flow of 9 gallons per minute from every 1,000 superficial feet, and that 1 inch of rainfall during 24 hours will yield 22 gallons per hour from the same area. It will thus be seen that, in the first case, if rain fell continuously for 24 hours at the rate of 1 inch per hour, no less than 12,960 gallons would flow from every 1,000 feet of the roof area; and in the second case, the quantity would be 558 gallons during the same time. By dividing these quantities by the decimal points of the fall, and by measuring the horizontal areas of the roofs from the eaves line, it will not be difficult to ascertain the provision it is necessary to make to store the great bulk of the fall. Sudden rain storms, however, often discharge, in a few minutes, vast volumes of water, complicating the question of storage

and upsetting all our calculations. If the fall were regular during each month of the year, the whole question would be simplified, and a very moderate-sized tank or reservoir would suffice; but, as this never takes place, it is necessary that the storage should be large enough to retain all which can be collected, as every available gallon is required.

A very simple rule will enable any person to estimate readily, and with a fair approximation, the storage space necessary for roof waters:—

> "Measure the horizontal areas of all roofs from eaves to eaves (not the slope of the roof, as that would give an extended area); multiply this in square feet by half the annual rainfall in inches; the product will give the quantity of water, supposing every gallon is secured. But, as there is a considerable loss through evaporation, storm overflows, &c., it will not be safe to calculate on securing more than about half of this quantity."

Suppose, for instance, the roofs of an ordinary farm-house with outbuildings, sheds, stables, &c., totalled 3,000 superficial feet in area, which, it must be remembered, is obtained by multiplying the length by the breadth horizontally, and suppose the annual rainfall of that district were 40 inches per annum, then 3,000 square feet multiplied by 20, which is half the rainfall, will equal 60,000 gallons per annum, of which quantity about one-half may be secured. For storing this, tanks would be required capable of holding 10,000 gallons, or one-third the quantity; this would mean five galvanised iron tanks of 2,000 gallons each, or ten of 1,000 gallons each; or it may be stored in one 10,000-gallon galvanised iron tank above ground, as described below, or in one 10,000-gallon brick or concrete underground tank, also as presently described.

If galvanised-iron tanks are used, let it be seen that the iron is specially made for tank purposes, as much of that now on the market is unsuitable for this purpose, having only a very thin and imperfect coating of spelter, causing it to rust very quickly, especially if exposed to a saline atmosphere. A special tank iron is, however, manufactured which is very suitable for the purpose, and which will far outlast that already referred to. In ordering tanks, the best special iron should be specified, and the gauge should not be less than 24. They should be well riveted and soldered, sides, top, and bottom, made frog-proof, fitted with brass cleansing plugs, mosquito-proof hoppers, and brass taps proof against the designs of clever horses. The best quality galvanised iron tanks cost in Brisbane, at present, £4 5s. for 1,000 gallons, and £7 10s. for 2,000 gallons, to which the cost of stands must be added, with freight, &c.

A very useful kind of tank can be made by bolting together curved sheets of galvanised iron, with lengths of saddler's cloth soaked in red oxide and oil, embedded in the joints. These tanks are open at the top, laid on a prepared bed of clay or other suitable material. The bottom is riveted and soldered at the joints, and the area may be made large enough to suit any size up to, say, 30,000 gallons. The sides, however, should not be more than three sheets in height without special stiffeners,

and the top edge should be finished with an angle-iron or a galvanised-iron pipe bent round with the curve. When the bottom is fixed in position, and the joints properly riveted and soldered, the saddler's cloth should be cut into strips 4½ to 6 in. in width, and soaked over night in the red oxide and oil. When ready, double the felt, place in position, and bolt up with bolts 6 in. apart on the body and on every corrugation on the perpendicular. Such tanks may be had in Brisbane, all ready for fixing and building up, at the following prices:—1,000 gallons up to 10,000, 35s. per 1,000 gallons; 10,000 to 30,000 gallons, 32s. per 1,000 gallons. It must be remembered that these tanks are not covered, and the water is liable to become coated with a green, slimy substance which is not, however, otherwise objectionable. For some time now, it has become the practice to paint water tanks both inside and out with various compositions, with the object of preserving the iron against the action of the water. Boiled linseed oil and Portland cement is often used, mixed sufficiently thick to lay on with a brush; and when the first coat is thoroughly dry, it is again coated in the same way. Bitumentic solution is another material often used successfully for the same purpose, but is more expensive to apply. Whatever material is used should be of an elastic character, or it may crack and peel off when the tank is empty owing to the contraction and expansion of the iron. The bolted tanks, described above, would be improved by being placed on a floor of concrete 4 in. thick, which would cost about 4s. per superficial yard extra to the above prices.

Various devices have been introduced for separating pure from impure roof waters. They are usually placed in close proximity to the storage tanks, and, if they could be relied upon, they would possess some value; but wherever mechanical contrivances are introduced, they need attention, and, if neglected, then they become a source of annoyance and injury rather than a beneficial accessory. No useful purpose would be served by describing or illustrating these ingenious appliances, but, if at any time required, most master plumbers will be able to give full information.

For storing 10,000 gallons underground, the tank would require to be 1,600 cubic feet capacity. A convenient diameter would be 12 ft. with a depth of 14 ft. 6 in. If built of brickwork, the excavation need not be taken out so carefully, as all inequalities and cavities will be filled in again behind the brickwork as it is built up; but if built of concrete, it should be taken out carefully and trimmed down to the exact radius, or much concrete will be wasted. Moulds will be necessary for the inside circumference to keep the concrete in position until set; but if a facing of 4½ in. of brickwork is used, backed up with 3 in. of concrete, no moulds will be necessary. The estimate of cost given below may be considered reliable on Brisbane values, and will serve to illustrate the difference in cost between under- and above- ground storage; but it must not be forgotten that the galvanised iron tanks will require to be renewed periodically, while the concrete tank is practically indestructible.

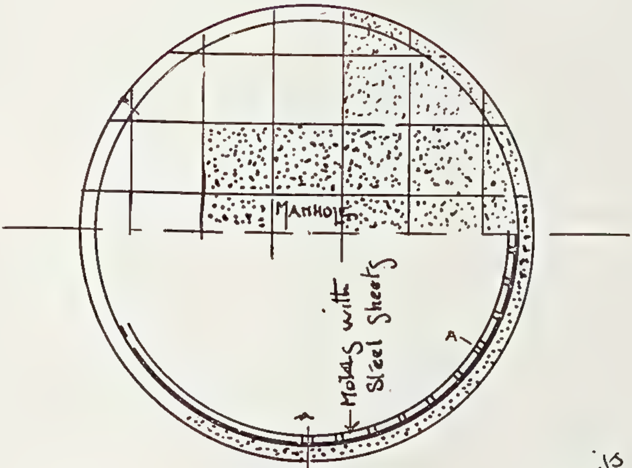

FIG. 9

PLAN OF TANK

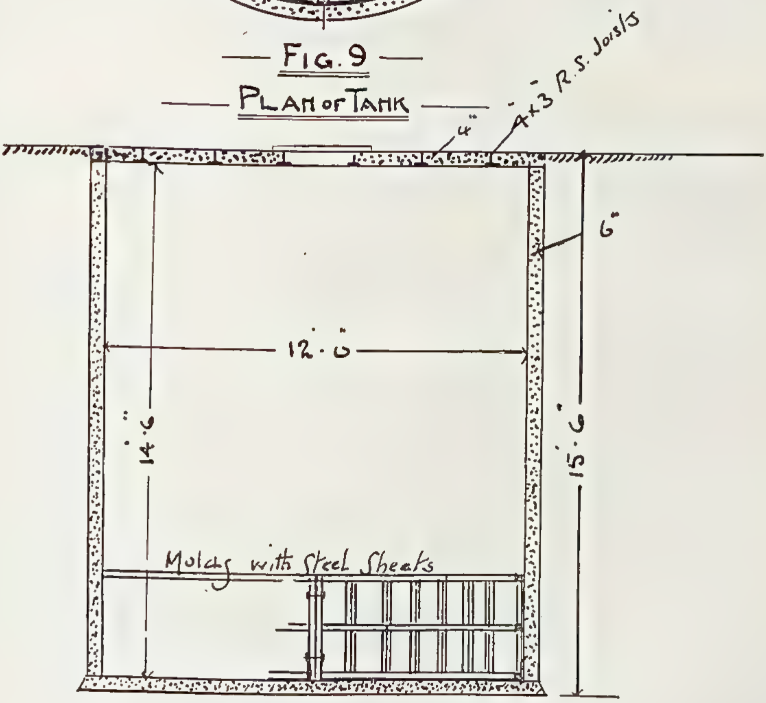

FIG 10

SECTION OF TANK

A. M.
18-11-12

ESTIMATE OF COST OF UNDERGROUND TANK FOR 10,000 GALLONS.

Tank to be 12 ft. internal diameter; inside depth, 14 ft. 6 in.; walls and bottom to be 6 in. thick; top to be 4 in. thick on 4 x 3 rolled steel joists. Concrete to be composed of six parts of clean fresh river gravel with a fair proportion of fine sand and 1 part of cement, or 4 parts broken stone to 1½-in. gauge, 2 parts clean sharp sand, and 1 part cement. Bottom and walls inside to be floated off with 2 parts clean sharp sand to 1 part Portland cement. Timber centring or staging will be provided for carrying the top until sufficiently set. This must be propped up from the bottom and made perfectly safe.

The manhole to be covered with a 1½-in. hardwood cover.

The moulds for forming the circular walls should be six in number, framed with 4 x 2 pine cut to the required curve, and blocked up with 2 x 2 every 12 in. apart, as shown in drawing. The inside of these frames to be then covered with a 6 x 3 sheet of 24-gauge steel, well nailed with flat-headed nails, thus forming the inside support for the concrete wall. Moulds to be bolted together at each end, thus forming a complete ring with a wedge-shaped piece inserted in the cast to facilitate removal.

	£	s.	d.
74 Yards cubic excavating and carting away, at 2s. 6d. ..	9	5	0
14½ Cubic yards concrete in floor, walls, and top, well rammed in position. This will require—16 casks of cement, at 15s.	4	10	0
16 Yards of gravel, at 7s.	5	12	0
Labour on 14½ cubic yards putting in, at 15s.	10	17	6
73 Yards super. rendering in cement walls and floor, at 1s 6d.	5	9	6
3 Cut rolled steel joists, at 14s.	2	2	0
Total	37	16	0

To which must be added the cost of the moulds for building up the walls and the centring for top.

If well done, this work will be practically indestructible.

Should any difficulty be experienced in making the same watertight, let it have two good coats of alum and soft soap, or two coats of boiled linseed oil, which will fill up the pores and gradually prevent absorption.

The following simple rules may be used for ascertaining approximately the content of any circular tank:—

1. Square the diameter in feet, and multiply by 5, and multiply again by the number of feet in height. This will give gallons.
2. Square the diameter in inches. The result gives the weight of water in height. Cut off the right-hand figure, and the result gives gallons, because 10 lb. of water equals 1 gallon.

3. To find the weight of water in any large tank in tons when full—

Reduce the contents to cubic feet, and divide by 36 for tons weight.

Thus in a tank—

20 ft. x 12 ft. x 6 ft. = 1,440 cubic ft.

1,440 ÷ 36 = 40 tons of water when full.

One gallon of water weighs 10 lb. and contains 227·274 cubic inches; and 1 ton contains 224 gallons or 36 cubic feet.

[TO BE CONTINUED.]

RHODES GRASS AGAIN.

We have received a letter from Mr. T. C. Black, of Brigalow, which fully bears out what Mr. Brooks, Instructor in Agriculture, stated about it in the last issue of the journal. Mr. Black has 300 acres under Rhodes grass, and last year, off 45 acres, he made upwards of £500. Every farmer in the Brigalow, he says, has it. This should certainly settle all doubt as to the superiority of this grass over Paspalum.

TIMES OF SUNRISE AND SUNSET AT BRISBANE—1912.

Date.	September.		October.		November.		December.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·3	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·1	5·34	5·28	5·47	4·58	6·6	4·46	6·29
3	6·0	5·35	5·27	5·48	4·57	6·7	4·46	6·30
4	5·59	5·35	5·26	5·48	4·56	6·8	4·46	6·30
5	5·58	5·36	5·25	5·49	4·55	6·9	4·46	6·31
6	5·57	5·36	5·23	5·50	4·55	6·9	4·47	6·32
7	5·56	5·36	5·22	5·50	4·54	6·10	4·47	6·32
8	5·55	5·37	5·21	5·51	4·54	6·10	4·47	6·33
9	5·54	5·37	5·20	5·51	4·53	6·11	4·47	6·34
10	5·53	5·38	5·19	5·52	4·53	6·11	4·47	6·35
11	5·51	5·38	5·18	5·52	4·52	6·12	4·47	6·35
12	5·50	5·39	5·17	5·53	4·51	6·12	4·48	6·36
13	5·49	5·39	5·16	5·54	4·51	6·13	4·48	6·36
14	5·48	5·40	5·15	5·54	4·50	6·14	4·49	6·37
15	5·47	5·40	5·14	5·55	4·50	6·15	4·49	6·37
16	5·46	5·41	5·13	5·55	4·50	6·16	4·50	6·38
17	5·45	5·41	5·12	5·56	4·49	6·17	4·50	6·39
18	5·44	5·41	5·10	5·56	4·49	6·17	4·50	6·39
19	5·42	5·42	5·9	5·57	4·49	6·18	4·50	6·40
20	5·41	5·42	5·8	5·58	4·48	6·19	4·51	6·41
21	5·40	5·43	5·7	5·58	4·48	6·20	4·51	6·41
22	5·39	5·44	5·6	5·59	4·47	6·21	4·52	6·42
23	5·38	5·44	5·6	6·0	4·47	6·22	4·52	6·42
24	5·37	5·44	5·5	6·0	4·47	6·22	4·53	6·43
25	5·36	5·44	5·4	6·1	4·47	6·23	4·53	6·43
26	5·35	5·44	5·3	6·1	4·47	6·24	4·54	6·44
27	5·33	5·45	5·2	6·2	4·46	6·25	4·54	6·44
28	5·32	5·45	5·2	6·2	4·46	6·26	4·55	6·44
29	5·31	5·46	5·1	6·3	4·46	6·26	4·55	6·45
30	5·30	5·47	5·0	6·3	4·46	6·27	4·56	6·45
31	...	...	5·0	6·4	...	...	4·57	6·45

PHASES OF THE MOON.

			H. M.
4 Sept.	☽	Last Quarter	11 23 p.m.
11 „	●	New Moon	1 48 „
18 „	☾	First Quarter	5 55 „
26 „	○	Full Moon	9 34 „
4 Oct.	☽	Last Quarter	6 48 a.m.
10 „	●	New Moon	11 41 p.m.
18 „	☾	First Quarter	12 6 „
26 „	○	Full Moon	12 30 „
2 Nov.	☽	Last Quarter	1 37 p.m.
9 „	●	New Moon	12 5 „
17 „	☾	First Quarter	8 43 a.m.
25 „	○	Full Moon	2 12 „
1 Dec.	☽	Last Quarter	5 p.m.
9 „	●	New Moon	3 7 a.m.
17 „	☾	First Quarter	6 6 „
24 „	○	Full Moon	2 30 p.m.
13 „	☽	Last Quarter	6 12 a.m.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RECORD OF COWS FOR MONTH OF OCTOBER, 1912.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Rosalie ...	Ayrshire	5 Aug., 1912	1,012	4·2	47·61	
Bliss ...	Jersey	22 Aug. ,,	622	6·2	44·99	
Glen ...	Shorthorn... ..	5 Sept. ,,	1,036	3·6	41·44	
Careless ...	Jersey	14 Sept. ,,	895	4·0	40·00	
Auntie ...	Ayrshire	4 July ,,	803	4·2	37·78	
Miss Edition	Jersey	13 Aug. ,,	801	4·2	37·68	
Reamy ..	Ayrshire	9 Aug. ,,	845	3·6	33·80	
Lady May ...	,, ...	19 July ,,	494	5·6	32·27	
Lady Lock ..	,, ...	10 July ,,	832	3·4	31·31	
Bluebelle ...	Jersey	2 Aug. ,,	663	4·0	29·63	
Lady Morton	Shorthorn... ..	9 Feb. ,,	480	4·8	25·96	
Gem ...	,, ...	29 April ,,	562	3·8	23·79	
Miss Heydon	,, ...	21 Mar. ,,	625	3·4	23·51	
Lerida ...	Ayrshire	4 Mar. ,,	402	5·0	22·69	
Honeycombe	Shorthorn... ...	29 Aug., 1911	419	4·6	21·67	
Nellie II. ...	,, ...	1 Feb., 1912	572	3·4	21·52	
Lady Margaret	Ayrshire	4 May ,,	634	3·0	20·87	
Butter ...	Shorthorn... ...	10 Nov., 1911	340	5·2	20·62	
Mist ...	Holstein	20 Oct. ,,	554	3·8	20·19	

THE CAUSE OF WARTS IN CATTLE.

The causes of warts are various, but they are hyertrophied papillæ of the skin. Ointments and lotion are of little service for removing them. It is always best to remove them with a pair of pincers or a hot iron. In many cases, the fingers are sufficient. After removal, dress the wounds once or twice daily with corrosive sublimate solution—1 part to 1,000 parts of water.

THE DUAL-PURPOSE COW.

" One of the stock arguments in favour of dual-purpose cattle is that they are better fitted for the service of the average farmer. Some go as far as to say that such cattle are best for farmers who do not know enough to handle dairy breed cattle as they ought to be handled. Now that is not an argument in favour of the cattle, but rather it is an argument in favour of ignorance. It is the same as saying that a poor, unfit tool is the best for an ignorant man. Will such a tool ever lead him out of his ignorance? No. Nor will unfit cattle ever lead the average farmer to be anything more than the average. There is an education that comes from associating with good cattle, that are most profitable to their purpose. Also there is a tendency to promote skill if we use good tools. But poor cattle and poor tools educate the farmer down, not up."—" Hoard's Dairyman."

Poultry.

REPORT ON EGG LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, OCTOBER, 1912.

Four thousand four hundred and twenty-six eggs were laid during the month, an average of 147·5 per pen. Yangarella Poultry Farm's pen win the monthly prize, with 173 eggs. The following are the individual records:—

Competitors.	Breed.	Oct.	Total.
R. Burns	Black Orpingtons ...	161	882
T. Fanning	White Leghorns ...	161	839
J. Gosley	Do.	143	831
A. T. Coomber	Do.	149	814
E. A. Smith	Do. (No. 2)	157	800
Range Poultry Farm	Do. (No. 1)	142	790
A. R. Wooley	Do.	135	782
H. Tappenden	Do.	147	777
Yangarella Poultry Farm	Do.	173	771
J. R. Wilson	Do.	155	756
Mrs. Beiber	Brown Leghorns ...	150	736
W. D. Bradburne, N.S.W.	White Leghorns ..	140	731
E. A. Smith	Do. (No. 1)	137	724
R. Burns	Silver-laced Wyandottes	137	723
Cowan Bros., N.S.W.	White Leghorns ...	140	703
Mrs. Sprengel	Do.	162	681
B. Holtorf	Do.	150	675
J. Zahl	Do. (No. 1)	129	664
A. H. Padman, S.A.	Do.	164	633
Range Poultry Farm	Do. (No. 2)	149	627
H. Hammill, N.S.W.	Do. ...	143	619
J. Zahl	Do. (No. 2)	151	618
J. Holmes	Do.	134	613
D. Grant	Do.	163	596
W. W. Hay	Black Leghorns ...	138	574
F. W. Cornish	White Leghorns ...	157	563
Mrs. Dredge	Do.	125	560
J. F. Dalrymple, N.S.W.	Do.	120	533
R. Burns	Do.	151	532
Mrs. Craig	Do.	163	521
Totals	...	4,426	20,668

State Farms.

ROMA STATE FARM.

WHEAT MANURING EXPERIMENTS, 1912.

These tests have been continued during this season, and, though the resultant yields are not as great as those obtained last year, they still illustrate the great benefits which accrue from the application of fertiliser in some form.

The peculiarities of the season, which were most marked, influenced the yields in many ways. In the first place, the preparation of the seed bed, owing to the dry conditions, could not be carried out in a thorough manner. Then, when rain was experienced it had such a soddening effect upon the soil as to nearly nullify the improved physical condition due to cultivation. It also resulted in a good deal of the manure being lost to the use of the plants, and destroyed much of the seed on the clay pans and where the soil was stiff.

That it was the poor physical condition of the soil which resulted in the destruction of the grain was exemplified by the stable-manure block where such has been improved. Here, hardly a grain failed to germinate; the plants appeared a day and a-half before those elsewhere, and continued to grow until the middle of September. Had rain then been experienced this block would have given a greater response than any other.

In Blocks 9, 11, 12, and 13 the conditions in places were just the reverse, and there are portions where not a grain sprouted, which is not to be wondered at, seeing that in these places the water was lying on the surface for over a week during the June rains.

It is to be regretted that the season was not altogether an ideal one for demonstrating the full value resulting from the application of artificial fertilisers as an aid to the wheat crops, as the results of experiments in 1910 and 1911 had claimed the attention of a few farmers in the district—so much so that they this season tested it for themselves, and in one or two instances in no small way.

Probably there is a larger area of wheat-growing land in the Roma district requiring fertilising, owing to natural poorness or depletion of plant food by the continued growing of one crop, than in any portion of the State, and there is no doubt that demonstration plots, such as have been established in the other districts, would prove of great value here, and it is hoped that such will be done in the near future, as it is thought that a revival in the wheat-growing industry is about to take place in the Maranoa.

The following are the results of the experiments carried out on the loamy soils, which, it may be added, have been cropped every year with wheat since 1906. [N.B.—The duplicate experiments, situated on the very light sand, were destroyed this season by frost.] :—

Block.	Manure Applied per Acre.	Cost.	Remarks.	Yield per Acre, 1912.	Average for 1910, 1911, and 1912.
				Bushels.	
1	Shirley's cereal manure, 1 cwt. to acre	5s. 6d.	Crop very thin; even height	20·6	21·2
2	1 cwt. Shirley's cereal manure ... ... ½-cwt. nitrolin lime (top dressing)	5s. 6d. 7s. 6d.	Crop little thicker than No. 1; grain better quality ... .. Top dressing applied third week July.	22·6	23·3
3	½-cwt. Shirley's cereal manure ... ... ½-cwt. nitrate lime (top dressing)	2s. 9d. 6s. 9d.	Crop similar in appearance to No. 2; little better at east end of block Top dressing applied third week July.	23·2	23·5
4	Control, unmanured	...	Crop uneven; portions on poorer soil very thin	18·4	18·8
5	1 cwt. superphosphate	7s. 6d.	Crop thin; straw fine, and shorter than in 1, 2, 3; very little flag; heads well filled; grain good	20·6	22·8
6	Thomas' phosphate, 1 cwt. to acre	5s. 6d.	Remarks as applied to 5	20·2	19·4
7	Stable manure, 15 tons ... ... ½-cwt. superphosphate	£2 5s. 3s. 6d.	This block from the beginning looked splendid, and had rain been experienced early in September a heavy yield would have been secured. Very flaggy; stooled well; dry weather; tip on clay pans; very even. Ground did not consolidate much after heavy rains	24·3	21·3
8	1 cwt. superphosphate ... ... ½-cwt. nitrate of lime (top dressing)	7s. 6d. 6s. 9d.	Crop very uneven; very thin in places, due to uneven quality of the soil	19·3	19·7

Block	Manure Applied per Acre.	Cost.	Remarks.	Yield per Acre, 1912.	Average for 1910, 1911, and 1912.
				Bushels.	
9	½ cwt. nitrate of lime ... ½-cwt. sulphate of potash ... 1 cwt. superphosphate ...	6s. 9d. 8s. 7s. 6d.	This block is situated on a clay pan, which, after rain, sets like cement. The germination in this and the succeeding blocks was lower than any of the previous. On one large patch where the water lodged no plants appeared	15·7	17·4
10	½-cwt. dried blood ... 1 cwt. superphosphate ... ½-cwt. sulphate of potash ...	5s. 3d. 7s. 6d. 8s.	Crop very uneven; very thin in places. At west end a tongue of good soil extends a small way into block	19·8	19·8
11	Control, unmanured ...	...	Crop very thin; uneven in height. The good soil at west end twice the area of that in 10 block	17·0	18·2
12	½-cwt. dried blood ... 1 cwt. Thomas' phosphate ... ½-cwt. sulphate of potash ...	5s. 3d. 5s. 6d. 8s.	Crop very uneven in quality and height; soil also very uneven. Grain failed to germinate in one large patch in block; more good soil at west end than in 11	19·1	20·9
13	½-cwt. dried blood ... ½-cwt. sulphate of potash ... 1 cwt. superphosphate ... ½-cwt nitrate of lime (top dressing) ...	5s. 3d. 8s. 7s. 6d. 6s. 9d.	Crop very uneven; grain failed to germinate in two large patches; more good soil is found at west end of this block than in 12	17·3	20·6

The top dressing of nitrate of lime was applied by means of the fertilising drill, the tubes of which had to be watched to prevent clogging in damp weather. The discs were removed to expedite matters—not because they might injure the crop.

The only two blocks showing an increase on the average yearly yield this season are those treated with Thomas phosphate and stable manure. In the former case it may be due to the specific gravity, and, if so, may prove to be the most suitable manure for districts with torrential rainfall, where soils which admit of slow percolation exist. With the stable manure, as already mentioned, it is undoubtedly due to the improved mechanical condition of the surface soil, which admits of more rapid percolation and prevents evaporation.

STATE FARM, WARREN.

STANWELL PROGRESS ASSOCIATION'S VISIT.

It is always a great pleasure to me to conduct a body of farmers round the different parts of the farm. One hears their ideas, and has an opportunity on the spot of explaining our improved methods.

I had a pleasant and most interesting afternoon on Saturday, 2nd November, when the members of the Stanwell Progress Association paid one of their periodical visits to the farm. Having had a good harvest of many different crops, I was in a position to show them the successful as well as the unsuccessful crops. The crop which interested them the most was Cretan wheat, which was cut for silage in July, and the second cutting had just been harvested before their visit. This second cutting averaged 3 ft. 6 in. high, was free from rust, and well developed.

A comparison was made between this and Algerian oats. The oats had been planted under the same conditions as the wheat, but produced a very poor crop of about 1 ft. high, was a little affected with rust, and had no grain. Canary grass commanded special attention. Several of the farmers present had not seen the crop before, but some decided that they would plant some next year. Its strong, upright appearance and its freedom from rust, combined with its good colour, appealed to them.

Emmer, or Speltz, was a strange crop to the majority of them, but after they saw the crop one could realise in a moment that it would not be a strange crop in this district for long. It has been acclimatised here now, and I am delighted with this year's crop.

A great deal of surprise was shown when inspecting "Warren-grown" rice, and its suitability for chaff was discussed.

Some time was spent in the mouse-proof room inspecting and explaining the different samples of millets, panicums, &c. This served to show the visitors that Manchurian, German, and Japanese millets are far superior to the common panicum, which is usually planted in this locality as a summer crop. We had a little talk regarding the selection of seed maize, methods of planting, &c.

I also arranged a demonstration of maize-planting with our new two-rows maize planter. This seemed to interest the visitors greatly, as did

also the watching of the reaper and binder at work, it being the first time that many of the onlookers had seen this machine working.

The visitors admired the horses that drew these machines, and were greatly taken with the idea of our having only mares on the farm.

The orchard and vineyard were inspected, and methods of pruning, grafting, budding, and spraying of fruit trees was discussed.

The dairy cattle and pigs were inspected, and favourably criticised.

The improvement in pastures by the introduction of artificial grasses was explained.

A field of Rhodes grass alongside of the natural pasture soon demonstrated all that was necessary.

Before leaving, the members decided to have agricultural subjects discussed at the meetings of the association in future.

This resolution, if carried in its entirety, will soon revolutionise the farming industry of the district.

GINDIE.

Owing in a measure to the splendid rain that fell in June last, the wheat here this season did well. It received rain early in July also, but did not get any more during its growth. The greater part of the area sown was got in previous to the June rain, so that the crop got a good start, and was soon reasonably thick. The crop was quite free from weeds. About 8 acres were planted between the June and July rains. This also was a very good crop. A further 4 acres were planted after the rain in July. This came up very thinly, and the fat-hen got a fair shart with it, and eventually won. This portion was not worth cutting.

Though the season was reasonably good, there was a marked difference in the crop where the land had been thoroughly prepared over other portions to which we had not been able to give the working that they should have received. The difference would have been still more marked had the rainfall been less.

I was much gratified with the result of a small area of Sixty-day oats grown here this season. It was the best that I have seen in the district. It is well known that this crop requires much more rain than wheat does, to bring it to maturity. The last two months previous to cutting, the weather was dry, and very hot, and in consequence the crop began to feel it. But, nevertheless, it cut about 2 tons to the acre, and carried a nice head of seed. I hope to try a few acres of this variety next season.

The accompanying photo of the binder is shown operating on a plot of C.B. 25 wheat. This was a very nice crop, and was cut just as the pollen had fallen. Cut at this stage, the hay has a beautiful colour, and the benefit of all the leaf is obtained.

Plate 44.—Sixty-day Oats.
Binder Cutting Crop of C.B. 25.
Same Crop in Stook.

PLATE 45.—THE FIRST LOAD.
EARLY ROSE AND BROWNELL'S POTATOES,
GINDIE STATE FARM.

Another variety of wheat that did well was C.B. 60. This gave a heavier return than the No. 25. It was of equal quality, but there was a trace of flag rust on one part where it was extra long. There is just a chance that it might develop rust in districts where the rainfall is greater than here.

One of the best varieties that I have grown for hay, and possibly for grain, is hay wheat. It has a strong root system, which enables it to stand up. The straw is fairly solid, of good colour, with an abundance of leaf. In the earlier stage of its growth, it creeps; later, it shoots upward, and leaves sufficient short leaf on the ground to amount to a fair mulch. But, as the binder cuts above this, it does not detract from

Plate 46.—Sheaves of Wheat, Barley, Oats, and Rye at Gindie State Farm.

the quality of the hay. It is eight or ten days later than many varieties, but this is an advantage, as it does not become over-ripe while the earlier kinds are being harvested.

Though a portion of the wheat here this season showed a white tip on the ear, owing to the dry weather during the last ninety days of its growth, it would have yielded a fair return of grain had it been thatched.

Rye and malting barley were also grown, and did very well. A part of the latter was used as green feed, and some cut for hay while it was in bloom. A small portion was allowed to ripen, but, as it got wet after being cut, the grain is somewhat discoloured.

TROPICAL VEGETABLES.

By C. E. WOOD, Manager Kamerunga State Nursery.

It is somewhat surprising that, in a tropical climate such as that of of North Queensland, people, instead of looking for vegetables which can be grown at almost any time of the year, either prefer to go without and grumble at the dearth of vegetables or else are satisfied to eat a very inferior imported article.

Take the potato. It is true that the potato can be grown in the tropics in favourable seasons and during the cooler months, but I have not found tropically-grown English potatoes good keepers; and when the small (usually very small) supply of local potatoes is finished, it is necessary to fall back on the imported article. As is well known, for many months past, the imported potatoes have not only been expensive, but, on the whole, of poor quality—at all events, by the time the consumer gets them. This being so, it is strange that people—or, at all events those on the land, or having vegetable patches—do not go in for either sweet potatoes or yams, both of which, I believe I am right in saying, are equally as nourishing as, if not more so than, the ordinary potato. Sentiment undoubtedly has a good deal to do with it, as is proved in all tropical countries, by the European residents always wanting the vegetables they were used to in the "old country," and calling such root crops such as sweet potatoes and yams "food for blacks," forgetful of the fact that the so-called "English" potato was originally imported from the tropics—namely, South America; and it is said that, when first introduced into Ireland, it was a very long time before it was looked upon with any great favour as an article of food.

Both yams and sweet potatoes can be grown well in the North; the latter are certainly more in favour now than they were a few years ago, and, whether boiled, baked, or fried, are a good, palatable, and nourishing food. Of the yams, there are many varieties; and if those who cultivate vegetables (even in their back yard) would but plant a small patch, I have no doubt that, in time, the undoubted good qualities of the yam would come to be recognised and a demand created, in which case yam cultivation would be numbered amongst the regular crops of the market gardener, and would be a source of regular income, as it grows well, gives good crops, and appears so far to be free of disease. As to which is the best variety, tastes will no doubt differ; but of the five or six varieties grown at the Kamerunga State Nursery, the Large White Potato and New Guinea Panna Potato (this latter is small and very similar to an English potato in appearance) should find favour with most. The White Chinese is also recognised as a good one, but owing to it going deep into the ground it must either be cultivated in high hills, or a good deal of trouble must be gone to in harvesting.

Yams should be planted during October or November, and most of the roots can be cut up into sets; but with the New Guinea Panna it is best to plant the small whole yams.

The Orchard.

A NEARLY SEEDLESS MANGO.

From the "Agricultural News," Barbados, of 14th September, we take the following account of an almost seedless mango, that has been given the name "Oahu," contained in the annual report of the Hawaii Agricultural Experiment Station for 1911, issued in April last:—

HISTORY.—A seedling tree about six or seven years of age bore fruit this year, and its characteristics have given justification for naming it Oahu. It is probably a cross between the Hawaiian sweet mango and the Crescent. Although the husk is present, the seed presents an undeveloped condition with often just the seed coat present. About 75 per cent. of this year's crop has had no visible seed.

The Oahu is valuable as a large, fine-appearing fruit of good quality. Its nearly seedless condition makes a thin husk with a large proportion of flesh. No mango weevil (*Cryptorhynchus mangiferæ*) has been found within these mangoes, and it will be interesting to note what may be the result of the attack of this insect on a fruit which contains no seed upon which its larvæ may feed. The Oahu is also worthy of propagation as a basis for breeding toward complete seedlessness.

DESCRIPTION.—Form, oblong, heavily shouldered at the cavity end and tapering towards the apical end; size, large, averaging in weight from 10 to 15 oz.; cavity, shallow, flaring, irregular; stem, slender; apex, variable, ranging from a point to a depression; surface, moderately smooth and undulating; colour, pale-yellow with a reddish blush on the exposed side; dots, numerous, small, yellow, depressed; bloom, bluish-white, moderately aboundant; skin, moderately thick, tough, very tenacious; flesh, thick, bright-yellow, juicy, with an abundance of fibre; seed, dried up or represented by just the seed coat; flavour, rich, moderately sweet, quality good. Season, June to August at Honolulu, Hawaii.

This tree is of the average height, and presents a broad, spreading habit.

FRUITING OF THE MALE PAPAYA.

With reference to a paragraph in the last number of the journal relating to the fruiting of the male papaya, as described in a paragraph in a French journal and reproduced in the "Hawaiian Forester," Senator T. D. Chataway writes: "The 'Hawaiian Forester' surely has discovered nothing. One may see in various parts of Australia male trees bearing a dozen or more fruit, while a grower in the Mackay

district, at my request, some years ago preserved the fruit, secured seed from it, and grew fresh trees, some being male and some female, the male trees again bearing fruit, though not in any larger quantities than in the first instance. Generally the male fruit is very small, but considered of better flavour than the fruit from the female trees."

[We are quite aware that many male trees in Queensland bear excellent fruit, having frequently seen them bearing in the Cairns district. The paragraph in question was published in the journal with a view to eliciting the information kindly supplied by Mr. Chataway.—Ed. "Q.A.J."]

Statistics.

COMMONWEALTH METEOROLOGY.

RAINFALL OF QUEENSLAND.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

Stations.	1911.			1912.									
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.
North.													
Ayr	...	...	...	...	...	3·53	1·16	1·01	6 70	...	...	Nil	·46
Bowen	1·5	0·19	1·32	1·56	3·15	1 86	0·59	1·76	3·78	...	0·18	Nil	2·46
Cairns	0·88	1·95	0 90	4·81	16·68	5·95	4·71	5·97	8·00	...	2·89	0·75	2 25
Geraldton (Innisfail)...	0·73	1·61	0·75	5·50	18·24	6·01	56·14	41·84	15·25	.	3·39	2·65	1·58
Gindie State Farm ...	0·81	...	3.50	0·68	2·59	1·88	0·63	...	9·94	3·45	...	Nil	1·54
Herberton	0·9	0·62	5·36	5·29	2·82	1·47	1·40	2·20	2·36	...	1·30	0·53	·78
Hughenden	Nil	1·37	0·69	5·78	1·84	3·52	Nil	0·74	6 64	...	Nil	0·13	Nil
Kamerunga State Nurs.	...	...	...	...	...	...	*	...	...	...	...	...	...
Mackay	0·93	0·17	0·41	2·08	8·04	·93	3·56	3·42	5·51	...	0·23	0·2	7·28
Mossman	0·55	0·86	3 31	6·06	18·32	17·60	6·40	2·78	8·88	1·33	1·98	1·80	5·49
Rockhampton	0·40	0·6	0·81	2·50	3·24	·14	0·01	1·98	8·38	...	Nil	Nil	6 87
Townsville	0·39	0·31	2·84	1·64	7·57	6·35	4·51	0·63	4·49	...	0·17	Nil	·64
South.													
Brisbane	4·95	0·84	1·94	1·85	2·13	1·03	0·72	0·20	7·22	...	1·32	0·43	5·85
Bundaberg	2·36	1·30	2·98	3·96	2·47	...	Nil	1·33	10·23	1·76	0·78	0·22	3 74
Bungeworgorai (Roma State Farm)	...	...	...	0·73	...	2·19	Nil	...	7·06	...	0·33	0·22	1·96
Crohamhurst	6·27	1·74	3·02	5·62	8·72	13·73	1·77	1·39	9·99	1·67	1·35	0·19	6·66
Dalby	3·45	1·99	1·55	1·76	2·58	·53	Nil	Nil	4·76	...	0 68	0·87	3 36
Esk	4·17	0 47	0 44	1·38	8·26	·22	0·36	0·11	7·43	...	1·13	0·52	2·57
Gatton Agric. College	3 77	0·49	1·90	3·56	3·31	7·86	1·35	...	6 63	1·84	1·04	0·53	4·99
Glasshouse Mountains	4·58	1·76	1·44	3·37	6·99	13·15	0·31	0·98	7 85	1·86	1·14	0·8	6·60
Gympie	2·42	0·50	2·10	2·92	4·47	·15	0·37	0·52	2·63	...	0·92	Nil	2 94
Ipswich	4·71	0·25	...	1·87	3·00	·41	0·30	Nil	3·93	...	1·02	0·49	4 04
Maryborough	2·81	0·90	4·98	2·39	3·93	·11	0·32	1·09	9·12	...	1·26	Nil	5 54
Roma	1·9	1·55	1·19	0·74	0 76	·85	0·03	Nil	7·96	...	0·77	0·28	1·95
Tewantin	7·48	1·14	2·13	5·60	4·25	·85	0·80	8·46	8·72	...	0·82	Nil	6·02
Toowoomba	...	...	...	...	...	·52	0·66	0·16	6·75	...	1·05	1·08	5·41
Warren State Farm ...	0·64	...	...	0·82	1·75	2·04	0·22	1·28	9 51	3·35	...	...	...
Warwick	1·78	2·26	0·70	1·57	3·45	·56	0·02	0·9	5·69	...	1·37	1·50	3·75
Warwick, Hermitage State Farm ...	0·60	...	...	...	...	...	...	...	...	...	...	...	...
Westbrook State Farm	...	...	...	...	...	...	Nil	...	...	...	...	...	...
Woodford	...	...	...	...	...	...	...	...	9·78	...	...	0·53	6·78
Yandina	2·90	1·36	1·87	5·95	4·84	·95	0·88	1·39	7·42	...	1·25	0·18	5·71

NOTE.—The rainfall data in this table are compiled from telegraphic reports, and must be considered as approximate only. * No Report.

GEORGE G. BOND,
Divisional Officer.

Horticulture.

POTTING AND WATERING OF FERNS.

We have occasionally been asked why ferns, under certain conditions, do not thrive; and the only answer is, that either the soil in which they are planted is unsuitable, or that drainage is imperfect, or that only slight surface watering has been given. A very excellent article on this subject is the following, published in "Garden and Field":—

As a rule, ferns only need repotting once in two years. When established, they do not like being disturbed; sometimes they may even do without repotting for three or four seasons, but about this time every one of them should be turned out of the pots, and, if everything be right, the drainage and every inch of the outer part of the ball will be one mass of fibres. If worms have been running amongst the roots, and the drainage is choked up with small particles of soil with no roots in it, then success need not be expected if they are allowed to remain in that condition. The drainage at least, must be removed, and clean material and a clean pot substituted; but in most cases of the kind it is best to repot altogether, and in doing this all bad soil and decayed roots should be removed. This will allow the plant to be replaced in a pot about the same size as that from which it came, and I would not use any much larger, as the roots do not require much space, especially when reduced. If plants in large pots are required, it is those furnished with large roots that should be transferred.

A mixture of rough loam, rough peat, and plenty of sand suits all kinds of ferns well. In potting, the finest of the mixture should never be put at the bottom. It must be on top, if anywhere; but very fine material should not be used. What soil requires to be put at the bottom should be placed carefully rammed down before the plant is put in, and, when space is limited between the old ball and the sides of the pot, it may be a difficult matter to get rough pieces filled in, but they should be pressed firmly down with a piece of stick, and care should be taken that no little vacancies are left. After potting, one thorough watering at the root should be given, and the soil will not become dry again for some days. By watering, I, however, mean more than once filling the space left for this purpose. After the first quantity has soaked in, another should be given; and if it is thought that this may not be enough to wet all parts of the soil, more may be applied. Once the whole of the material has become thoroughly wet, the roots are sure to go on well; but if only the surface soil is wetted, growth will neither begin nor continue satisfactorily.

Ferns whose fronds have become ragged and discoloured should be cut down to the crown. Plants which are treated in this way before they have begun to grow, and those which are repotted, should be cut

over when that operation is being performed. It is astonishing how much ferns may be benefited by weak doses of liquid manure given twice a week or so. Soot water and cow manure water are both good, and when these are used—especially in the case of plants which have not been repotted—the result is most satisfactory.

HOW TO GROW CUCUMBERS.

The cucumber is not very particular as to soil, so that it be light, rich, and loamy; it may be nearly all sand, provided that good rich manure be added, and that it be deeply dug. The cucumber bed should be sheltered from the westerly winds. The pits, or, as some call them, hills, should be made ready in August, in the following manner:—

Mark off the land in 6-ft. squares, and at each intersection make a hole 2 ft. in diameter. If the soil be not naturally rich, mix with it a compost made up of well-rotted stable manure, sheep or poultry dung, wood ashes, bonedust (if procurable), and a little salt. Fill up the hole with this prepared soil, and sow five or six seeds in it in a ring. Half an inch is deep enough for the seeds. When they are up, take out all but two plants in each hill. Stop all lateral runners as soon as they show fruit, and the secondary runners must be pinched back to the fruit in the same manner. If the weather is dry, give the beds a good soaking with diluted liquid manure about once a week. Water every evening sufficiently to damp the soil right down to the roots.

Make successive sowing during September, October, and November. To produce straight cucumbers, place under them three-sided boxes, 3 in. wide, with the open side uppermost.

A good way of watering cucumbers to ensure the water reaching the roots is, as soon as they show signs of running, to dig a hole large enough to hold a quart can, as near the roots as possible. Make holes in the bottom of the can, and place it in the hole near the roots of the plant. Put the cans in the ground, about 2 in. deep, and fill them with water every other day.

The choicest cucumber in cultivation is Lockie's Perfection. Early White Spine, Early Ridge Gladiator, and Long Prickly are also good marketing and table varieties.

Cucumbers are ready for market in from 75 to 105 days.

"Garden and Field" gives some very good and sound advice on this subject, premising that there is yet time in Queensland to sow the seed. The writer says:—

This is the time [November] for planting the general crop of cucumbers, and, as every reader who has a piece of land 10 ft. square can grow enough for a family, I propose to tell him how it can be done. There are many ways of growing cucumbers. I shall not tell him every way,

and, it may be, the methods I give will not be the best for him, but it will give good results.

People generally advise a great deal of preparation for growing cucumbers, such as digging out a trench, putting in 1 ft. of manure, making a seed bed of 4 in. of soil on the manure, and planting on the soil so prepared. This will give excellent results with care in watering; but with such a hollow bed below the plants will not stand any neglect. Still, the method is worth following for early plants; but in this case the manure needs to be new, or, rather, in the fermenting stage, so that it will really make a hot bed, which will force on the young plants.

For ordinary purposes no such provision is necessary. What is necessary is to thoroughly work the soil, as must be done where good results are desired in any gardening. The more deeply it is worked the better, provided the surface soil is kept on top. Liberal supplies of manure should be worked in, and the more rotted it is the better. Either horse, cow, sheep, or fowl manure will do; and, failing those, superphosphate or bonedust, wood ashes, and sulphate of potash—say from 1 lb. to 2 lb. of super, and from ½ lb. of sulphate to a plot of 10 ft. Do not give more, and thoroughly mix it with the soil.

PLANTING THE SEEDS.

Make the bed so that the water will not run off when you have to apply it freely in the hot weather. Two plants only are required for the space named (10 ft. square), and a proportionate number for a larger space; but in order to secure the most robust plants I would plant at least six seeds where I wanted one plant. I plant the six in a circle about 1 ft. in diameter, and when the strongest plants have runners 6 in. long, I pull out all but two, and when the strongest plant has runners 1 ft. long I remove the other. The removal of a healthy plant requires courage, and hence most growers have their plants too crowded.

While the plants are growing, they require to be well watered and regularly, but not sodden; and when they commence to develop fruit, liquid manure, or "cow tea," applied twice or thrice a week is decidedly good, if not necessary for the best success. Briefly, soak cow-dung in water, and give a little, say half a gallon, diluted until it is only slightly coloured, twice or three times a week. Water every evening moderately, rather than now and then heavily.

When the runners begin to bear female flowers—*i.e.*, those on the end of tiny little cucumbers—the ends may be nipped off. Side runners will put out, and also bear fruit, and may be treated in the same way. This nipping is not really necessary, but in the hands of a skilled man is beneficial.

When the plants are thinned out I like to mulch the ground well with stable manure and keep the bed well covered.*

* This is one great factor making for success.—Ed. "Q.A.J."

Viticulture.

OBSERVATIONS AND CULTURAL NOTES ON GRAPES.—No. 8.

By CHARLES ROSS, Instructor in Fruit Culture.

[CONTINUED FROM JULY NUMBER.]

In addition to the extensive collection of grapes of European and Asiatic origin, grown at Westbrook under the writer's management, forty native and hybrid American varieties were experimented with, of which the following proved in every way the best for table use and suitable for planting in coastal districts:—

37. *Alvey,* syn. *Hagar.*—A delicious little black grape, very early, belonging to the *Æstivalis* Class. The bunches are of medium size, shouldered, and loose; berry sweet, juicy, luscious, with a thin skin and almost seedless. The vine may be grown as a sturdy bush; the wood is short-jointed and easily propagated from cuttings.

38. *Concord, Labrusca* Class.—An early, good-sized black grape of handsome appearance, with rather thick tender skin, juicy pulp of fair quality, but of no pronounced flavour. The vine is a rampant grower, good constitution, heavy bearer, not subject to disease, and will stand rough treatment better than most varieties.

39. *Catawba, Labrusca* Class.—A fairly large grape, deep red with thin lilac bloom; pulp juicy and sprightly flavoured. The vine is fairly robust, and bears heavy crops, but is said to be susceptible to phylloxera where that disease is prevalent, and perhaps this fact alone would make one careful about planting it.

40. *Delaware, Vinifera—Æstivalis* Hybrid.—A beautiful, light-red grape, very abundant, sweet and luscious flavour. The vine is a vigorous short-jointed grower.

41. *Elvira, Cordifolia* Class.—A very hard variety and immense cropper. The bunches and berries are rather small, but the size is improved by generous manuring. Thin skin, juicy, sweet, fine-flavoured pulp without foxiness. The vine is a short-jointed grower, and suitable for growing either as a bush or trellised.

42. *Goethe,* Rogers' Hybrid No. 1.—For the coast and interior this is the best of the *Labrusca vinifera* hybrids, of fine flavour, without

foxiness, and very early. The bunches are a good medium size and loose-shouldered; berry large, beautiful pale red when fully ripe, and very good before the colour sets in. Skin thin, pulp juicy, sweet, luscious and tender. Fine for table, but the ripest berries are liable to detach themselves from the bunch if roughly packed. The vine is a luxuriant grower, and is liable to over-bear when young; it should be grown on a trellis with permanent fruit rods, and short pruned; the number of bunches should be reduced immediately after setting.

43. *Lindley,* Rogers' Hybrid No. 7.—A good hardy variety and abundant bearer; bunches fairly large with medium-sized berries, skin tough, of brick-red colour and beautiful bloom; pulp sweet, juicy, and very high flavoured. On account of its excellent keeping qualities, is a good marketable grape. The vine is rather long-jointed and robust.

44. *Wilder,* Rogers' Hybrid No. 4.—A very fine early black grape, without foxiness, and, when well grown, is nearly as large and as good as some of the best Europeans. The bunches are of fair size, compact, and heavy; berry large, round, with blue bloom, tender pulp, sweet, brisk, and refreshing. The vine is constitutionally strong and generally healthy. It is very apt to over-bear, and should be severely thinned; short pruning is the best suited. One of the best of the American varieties for table and market use.

[CONCLUDED.]

TO GET RID OF ANTS.

Red ants may be driven from a house by using one-half tablespoonful of tartar emetic and the same amount of sugar dampened with a small amount of water, and placed wherever this pest is troublesome.

GROWING POTATOES UNDER STRAW.

A correspondent of the "New Zealand Farmer" (November, 1912) gives the following instance of potatoes being successfully grown under straw:—Mr. Hurst, a resident of Oamaru, tried growing potatoes under straw last season, and with successful results. The seed was laid on the ground and covered with straw to a depth of from 6 to 9 in. The yield was better than where the potatoes were grown in drills. When the straw was raked back at digging time, the potatoes were found just below the surface. The quality of the tubers was good, and were even better keepers than those grown in the ordinary way.

Tropical Industries.

SISAL HEMP.

From the latest reports received from London as to the present prices for sisal fibre and the future probabilities, it would appear that high prices which ruled from 1903 to 1907—£37 per ton—are likely to be again realised. Messrs. Landauer and Co.'s weekly report on the fibre industry for 25th September, 1912, says:—

PLATE 47.—THREE-YEAR-OLD SISAL AT GLADSTONE.

"*Mexican Sisal.*—The market is much stronger, latest quotations from New York being 6 cents, equal to £29 c.i.f. Europe. There are no stocks in New York. We are also informed that by far the greater part of the stocks in Progress are actually the property of American consumers, hence it is more than likely that the commodity will go still higher in price.

"*German East African Sisal.*—The market is very firm. Parcels on spot have been sold at the equivalent of £32 10s. per ton; while for shipment as far ahead as January-June, 1913, about 800 tons have been sold on the same parity.

"*Mauritius Hemp* (*Fourcroya*).—During the same month the prices quoted for this fibre were £26 10s. to £27 10s. for good fair; £24 to £25 for medium; and £22 to £23 for ordinary grade."

It is possible that the Mexican rebellion, and the terrible hurricane at Cebu, in the Philippine Islands, which is the principal seat of the Manila hemp industry, may account for the present high prices and foreshadowed higher prices for sisal fibre.

Plate 48.—Four-year-old Sisal at Gladstone.

Under the circumstances, even with the high wages ruling in Queensland for rural labour, those who are growing sisal here may taken heart of grace and look forward to good profits.

When sisal plants within four years on arid Queensland soil can attain the size of those shown in the accompanying illustration (omitted in our notice, in last month's journal, of Mr. J. Cornwell's plantation at Gladstone), there is no room for doubt as to the suitability of this hardy and easily grown crop in parts of Queensland, where no other crop, except perhaps prickly pear, could thrive.

A COLD CLIMATE RUBBER TREE.

Whilst it is true that the rubber trees generally grown on plantations in the tropics—such as Pará, Ceara, Rambong, and Castilloa—will not thrive and will certainly not be profitable to grow, even if they survive, outside the tropics, yet we find from the "Journal of Imperial Agriculture," London, that there is one variety of rubber tree (the *Sapium Thomsoni*) which, it is stated, will not only thrive and attain immense proportions at an elevation of 6,000 feet above sea-level, where the temperature falls many degrees below freezing point, the mean temperature being 57 degrees Fahr., but will give even greater annual returns of rubber than Pará.

The rubber is known in trade as *Colombia virgen,* and, next to Pará rubber, it is stated to have realised the best prices in the market. The trees bear in from six to eight years, trees five years old yielding as much as 1 lb. of rubber. In the sixth year the *Sapium Thomsoni* attains a girth of over 3 feet. When fully grown, the tree has a circumference of from 6 to 7 feet. The late Mr. R. Thomson, who discovered this tree about the year 1890, described it and its properties in a report on Colombia, published by the Foreign Office in 1895, stating that he found it thriving at an elevation of 8,000 feet. On the Colombian Andes he found that thousands of trees had been cut down and hundreds of tons of rubber had been extracted and exported to the United States. Mr. Thomson accompanied some rubber collectors into the great forest. The trunk of the largest tree encountered was over 100 ft. in height, and when cut down yielded upwards of 1 cwt. of dried rubber. Trees of smaller size yielded from 50 to 60 lb. of rubber. The price then realised for all rubber was very low, and the *virgen* rubber brought 3s. per lb. Mr. Thomson established a plantation 5,800 feet above sea-level, where the mean temperature is 62 deg. Fahr.

Rubber plants indigenous to tropical regions cannot be made to produce rubber in a temperate climate. *S. Thomsoni* can be grown in the salubrious climate of Australia. In all the scrub lands of Queensland above the Main Range, and on it (at Atherton and Gilberton), on the Blackall Range, and in many other cool districts of the State, even where severe frosts occur, the *virgen* rubber will, it appears, do well and yield rich returns.

Seeds of the plant can be purchased in London at the rate of 3/6 per 1,000, or in quantities of 50,000 at £3 per 1,000, and for 100,000, the rate is £2 per 1,000, f.o.b. London, obtainable rfom Messrs. N. Thomson and Co., 27 Cannon street, London, E.C.

AN ECONOMIC USE FOR SISAL FIBRE REFUSE.

The enormous amount of residue, pulp, and juice remaining after some thousands of sisal leaves have passed through the scutching machines has always been a source of trouble to growers and fibre producers. If allowed to run into creeks or rivers, the water is seriously polluted, and, if no outlet exists for it, it becomes a menace to health when in a state of

putrefaction, the fœtid odour from the fermenting mass polluting the air all round the neighbourhood. The "Rubber Review," of 10th October, reprints some useful notes on the profitable disposal of maguey and sisal refuse, by Mr. W. O. Barrett, published in the "Agricultural Review." Mr. Barrett says:—

ALCOHOL FROM MAGUEY SISAL REFUSE.

The sisal planters have been waiting patiently for the chemists to perfect the processes connected with the production of alcohol from the pulp and juice remaining after stripping the fibre from the leaves; until recently, however, the theory has been good, but the practice not very remunerative. A new apparatus—utilising a Barbet fermentation process, a Lawrence cooler, and a regular crushing mill similar to those used for cane—is now recommended in an article in "Der Pflanzer" as the best thing of the kind to date.

YIELD FROM SISAL REFUSE.

It is claimed that 1,000 ripe leaves will yield by this new method about 13 litres (22.88 pints) of high-grade alcohol, and, when certain improvements in the fermentation apparatus are instituted, 17 litres (29.92 pints) will possibly be obtainable. In the future all large sisal plantations will be provided with an alcohol plant, thus saving the residue which heretofore has been not only wasted but a positive danger in the vicinity of the factory. On account of the corroding action of sisal-leaf juice, it must not be allowed to come into contact with tin or iron; the refuse cannot be used even as a fertiliser, and it is, of course, useless as a stock food in any form. However, after removing the alcohol from the mixture of pulp and juice, the residue may be mixed with chalk or lime to neutralise the acid and then used for manure.

ALCOHOL FROM STUMPS.

Another point which makes for great economy on the plantation is the utilisation of the stem bases, or stumps, of the old plants; it is said that each old stump may be made to yield about 1¼ litres of alcohol by the new Barbet method. In Yucatan the life of the hennequen plant is much longer than that of the sisal; in Zambesia the writer has noted a large percentage of the plants (many with leaves of well over 2 metres), in what was perhaps the best sisal plantation in the world, beginning to flower in the fourth year from planting. But even in Yucatan, where plants yield leaf crops steadily for six to eight years or more, it is estimated that on a plantation producing 150,000 leaves daily there would be some 175,000 stumps to be removed and replaced by young plants each year; and over 200,000 litres (44,000 gallons) of alcohol at even 0.10 dollars per litre gives the splendid by-product income of 20,000 dollars (£5,000); the leaf alcohol from such a plantation should be worth some 70,000 dollars (£14,000).

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

BY F. MANSON BAILEY, C.M.G., F.L.S., COLONIAL BOTANIST.

Order LEGUMINOSÆ.

DESMANTHUS, Willd.

Flowers sessile in small pedunculate heads, 5-merous, hermaphrodite or the lower ones imperfect. Calyx campanulate, shortly toothed, petals free or slightly cohering, valvate. Stamens 10 or 5, free, exserted, anther eglandular. Ovary sessile or nearly so, glabrous, multi-ovulate; style filiform, stigma terminal, concave. Pod narrow-linear, straight or falcate, acute, compressed, thinly coriaceous, 2-valved. Seeds compressed.

D. virgatus, *Willd.* A shrub of 2 or 3 ft. with slender erect or ascending angular branches. Stipules, setiform. Pinnæ usually in 2-4 pairs, the rhachis with a large oblong, red, sessile gland below the lowest pair; leaflets "sensitive" in 10-20 pairs, linear-oblong, sub-apiculate, base obliquely truncate, sessile 1½-3 lines long. Pod usually straight, 2-3½ in. long, 1½-3 lines broad and usually bearing over 20 seeds.

Hab.: A native of Tropical America, but now naturalised in many warm countries; has lately established itself round about Brisbane, *C. T. White.*

Order COMPOSITÆ.

TRIDAX, Linn.

Perennial herbs. Leaves opposite, incisodentate or pinnatisect. Heads very long-peduncled, heterogamous, rayed; ray florets, female, fertile, ligulate or 2-lipped with the outer lip large, 3-fid or 3-partite, the inner smaller 2 lobed or 2-parted or none; disk florets hermaphrodite, fertile, tubular, limb elongate 5-fid. Involucral bracts few, seriate, outer short broad herbaceous; receptacle flat or convex, pales membranous. Anther-bases with short, acute auricles. Style-branches of the hermaphrodite flowers hairy above, tips subulate. Achenes turbinate or oblong, silky; pappus of short or long aristate, feathery bristles. A genus of several species all natives of Tropical America.

T. procumbens, *Linn.* (Plate 49.) A perennial trailing herb, branched in the lower part, branches and leaves scabrous with short bristly hairs. Leaves simple, opposite, petioled, rhomboid-deltoid, acute, deeply toothed. Heads few, medium-sized, many-flowered, on very long peduncles; scales of the involucre sub-equal, 2-3 serial, outer scabrous, ovate-lanceolate, acute, herbaceous, inner membranous, obtuse ligulate; receptacle scaly, a few outer flowers with yellow ligules, anthers not tailed. Achenes pilose, angular-cylindrical; pappus of a single row of densely plumose bristles.

Hab.: A native of Tropical America, but for some years past naturalised in India and the East Indies. I have recently received specimens collected by Mr. W. Young, Ollera Creek, Townsville, with the note that it is now common in that locality a along the coast and up creeks.

PLATE 49.—TRIDAX PROCUMBENS, *Linn.* *A*, outer involucral bracts; *B*, palea; *C*, ray (ligulate) floret and achene; *D*, disk (tubular) floret and achene; *E*, achene; *F*, pappus; *G*, a single pappus bristle. *A—G*, enlarged.

*CARTHAMUS, Linn.

Heads homogamous; florets all hermaphrodite, fertile (rarely a few marginal female or neuter). Involucre ovoid or subglobose bracts many-seriate, imbricate below, the outer or intermediate foliaceous and spinescent

PLATE 50.—CARTHAMUS LANATUS, *Linn.*, YELLOW DISTAFF THISTLE. *A*, flowering branch, nat. size; *B*, floret, nat. size; *C*, achene with its pappus end. (From a coloured illustration in F. v. Mueller's "Thistles," published by the Department of Agriculture, Victoria).

in the wild forms. Receptacle plane, setose. Pappus more or less paleaceous, many-seriate, occasionally none. Thistle-like rigid herbs, with alternate, spinose-pinnatifid or spinulose-serrate leaves and terminal solitary or cymose rather large often fiercely involucrate scarlet, yellow, whitish or rose capitula. A genus of about 20 species mostly natives of the Mediterranean region.

C. lanatus, *Linn.* (Yellow Distaff Thistle.) (Plate 50.) An erect, rigid, cobwebby, cottony or glabrate annual branching at the summit. Leaves pinnatifid, spinous, 1-2 in. long; the upper ones sessile acute, semi-amplexicaul, lanceolate; floral ones similar.—*Kentrophyllum lanatum, D. C. et Dub.*

Hab.: A native of the Mediterranean region, and now received as a naturalised weed in the Nanango district from Mr. C. H. Grove.

Order FUNGI.

CLATHRUS, Mich.

C. Higginsii, *n sp.* (Plate 51.) Receptacle of a red or vermilion colour, from top to base inside the volva about 4 in., from the rounded top

PLATE 51.—CLATHRUS HIGGINSII, *Bail.*

gradually tapering downwards to a blunt point within the volva; the upper clathrate portion about $2\frac{1}{2}$ in. in diameter and $1\frac{1}{4}$ in. deep, formed of somewhat angular areolæ of from $\frac{1}{3}$ to $\frac{2}{3}$ of an inch in diameter; the whole of the lower portion formed of 7 elongated meshes, the thickened borders of which have the appearance of pillars and join the entire portion of the receptacle near the base.

Hab.: On garden soil, Toowong, *Ralph Higgins.*

BOTANIC GARDEN NOTES.

BY J. F. BAILEY, Director.

FLOWERING OF THE TALIPOT PALM.

This year marks an interesting event in the horticultural history of Queensland—viz., the flowering for the first time in the State of the Talipot Palm (*Corypha umbraculifera*), a species belonging to Tropical Africa and India, and which attains a larger size than any other of this noble order of plants.

The specimen in question was planted about fifty years ago by the first Director of the Gardens, the late Walter Hill; and early in July of the present year it sent up from its crown a stout, erect flower-spike resembling a young growth of a bamboo stem. This afterwards developed a number of branches, and has now commenced to bear flowers. Owing to the dry conditions experienced during the early stages of the growth of the inflorescence (flowering portion), which, by the way, is the largest in the vegetable kingdom, the development of the latter was disappointing compared with those growing in their native habitats, one of which is described by Mr. McMillan, late Curator of the Peradeniya Gardens, Ceylon, in the following terms:—"The inflorescence, which tapers to the top, consists of fifty main branches, one of which was found to measure fifteen feet in length, having twenty-six branches averaging two feet in length. The branch measured required three strong coolies to carry it; thus, making allowance for the smaller branches at the top, quite one hundred coolies would be required to carry the whole inflorescence. The individual flowers are inconspicuous, greenish-white, and unpleasantly scented. Estimating the number counted on one spike, the whole contained some millions of flowers."

The leaves of the Talipot are very large, but decrease in size as the plant reaches maturity. They are of a semi-circular fan shape.

As is the case of palms generally, most parts of a Talipot is used in its native country for some useful purpose. The leaves are made into

mats, fans, and umbrellas, and are used for writing on and for thatching. A bread is made of the pounded soft interior of the trunk.

The seeds have the hardness of iron, and are known as Bazarbatu nuts, and are largely used in the manufacture of buttons.

Plate 52.—The Talipot Palm Flowering in the Brisbane Botanic Gardens.

Trimen states that the young fruit pounded is used for stupefying fish.

A regrettable incident in connection with the flowering of this palm is that within a short time afterwards the plant dies.

Animal Pathology.

VACCINATION AGAINST HOG CHOLERA.

The Department of Veterinary Sciences of the Kansas State Agricultural College Experiment, U.S.A., has issued an exhaustive bulletin on the results of experiments during 1911 and 1912, in combating hog cholera by vaccination, and states that the use of anti-hog-cholera serum as a preventive of hog cholera has passed the experimental stages, While there is no doubt that a great many improvements will yet be made in the methods of production and application, its efficiency can no longer be questioned. Out of a total of 235 diseased herds, 100 per cent. of the hogs vaccinated were saved in 40 herds, and nearly 70 per cent. of all hogs vaccinated in all diseased herds were saved, showing that the serum has some virtue even as a curative agent, although in this it should not be relied on. Vaccination should be done while the animals are still healthy; but, if cholera is present, a large percentage is saved through the use of the serum; and the earlier it is used in an outbreak, the greater the percentage saved.

During 1911, 292,400 hogs were vaccinated with the serum produced by the Veterinary Department of the Kansas State Agricultural College, and reports were received on results covering 32,000 head. Of these, 25,893 were given the serum-alone treatment; 3,222 were given the simultaneous method; and 3,779 were vaccinated with the double method —that is, were given the serum alone, and about ten days later were given the simultaneous method. Of the total number, 18,109 were in infected herds, and 14,785 were in non-infected herds.

The losses in non-infected herds, where serum alone was used, amounted to about 1 per cent. In the main these losses were confined to a very few herds, and the greater number of losses were directly traceable to other causes. In infected herds, where the serum was used, there was a saving of 69·8 per cent. In many of these herds the disease had gained such a foothold that practically all animals in the herd were sick at the time of vaccination. In other instances, where as many as 50 per cent. of the herd had died of the cholera, vaccination stopped the progress of the disease at once, with very few losses following, and in many herds no further losses occurred.

THE THREE METHODS OF VACCINATION

are as follow:—

The Serum Method Alone.—The first method is to use the serum alone. In this method there is simply injected into the tissues of the hog a dose of the anti-hog-cholera serum, which make the hog immune

against the cholera for a time varying from a few weeks to several months. This is the method used when, for instance, a very fat show herd is vaccinated. It is absolutely safe. It is also used in herds where the cholera exists, or where some of the animals have been exposed to the disease. After the disease has been in the herd for several days, it frequently occurs that vaccination does very little good. Thus the earlier the vaccination, the more certain the result. A day's time may mean either the loss or saving of a large part of the herd. Where vaccinating is done in diseased herds, the amount of serum is increased from one-half to double the regular dose.

The Simultaneous Method.—The second method is one in which there is some danger, but the result, if the animal survives, should render the animal immune for the rest of its life. It is the simultaneous method. In this there is injected at the same time as the serum, but in a different place, a small amount of virulent blood, or blood taken from a hog very sick with the cholera. This method really gives the hog a slight form of the disease, and, as a consequence, the animal does not take the cholera a second time—it has been artificially immunised. This is a very satisfactory method when used in a healthy herd—that is, before the animals become infected. Great care is necessary in this method that too much of the virulent blood is not used; if the dose of this is too large, the form of the disease may become so severe as to make the hog quite sick with the cholera, and it may even cause death.

The Combination Method.—The third method is the one which was originated and thoroughly tested by the author of this bulletin (No. 182), F. S. Schoenleber, and is a combination of the first and second methods. Vaccinate first with the serum alone, and ten days later vaccinate with the simultaneous method. This is by far the most satisfactory and safe method in an exposed herd; or if there is cholera in the herd or in the vicinity; or if the hogs are fat or otherwise valuable.

Where to Vaccinate.—The ordinary method is to vaccinate on the inside and in the fleshy portion of the ham. While this method brings results, as far as vaccination is concerned, the method is undesirable because this location is easily infected, causing tumours or abscesses, which are very objectionable to the packers, frequently ruining a considerable portion of the most valuable portion of the hog. Some operators vaccinate immediately under the skin under the jowl or flank. Sows heavy in pig are sometimes vaccinated just back of the ear. These two last methods have the disadvantage of its taking longer to absorb the serum, but they are less liable to cause serious infection.

*Veterinarians should do the Vaccinating.**—On account of using the dangerous virulent blood and the ease with which the disease is

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* The Live Stock Law of the State of Kansas makes it unlawful for any person to knowingly inject any virulent hog-cholera blood into any hog in the State of Kansas, except under the direction of the live stock sanitary commissioner. But this does not apply to the authorities of the State Agricultural College at Manhattan, Kansas. The penalty is £100, with a minimum of £10 for each offence. —ED. "Q.A.J."

spread, it has seemed advisable to have the vaccinating done by graduate veterinarians who have received proper instructions in the methods, and are qualified to handle the dangerous materials. The danger is thus reduced to a minimum, although, in spite of the greatest care, there are, at times, losses from vaccinating.

Immediate Effects of Vaccination.—When the serum is potent, and the work is properly done, the hog seldom loses a feed. The serum, however, causes a reaction, and slight fever frequently follows. For several days the temperature may vary several degrees, sometimes going to 106 degrees, and even higher. In from six to ten days, after vaccinating with the "serum-alone" method, the temperature should be back to normal again—about 103 degrees. In the simultaneous method several weeks should be allowed for the vaccination to take full effect.

Losses from Vaccination.—The susceptibility of hogs to the disease varies greatly in different herds and even in the same herd. At times there are a few hogs in a herd which are so susceptible to the cholera germ that no amount of serum will prevent them from dying with the disease. Again, there are losses in vaccinating hogs, not alone from the fact that they may be extremely susceptible (hyper-susceptible), but from infection through the wound made by the needle. This loss, all told, when all the conditions are right, and the work properly done, should not be more than from 1 to 2 per cent. of all the animals vaccinated in healthy herds. Ordinarily there are no losses whatever.

Other causes of loss mentioned in the bulletin are:—Animals sick with pneumonia, or some disease other than cholera; too small a dose of serum; infection getting into the wound made by the needle in vaccinating; exposure to weather after vaccination; turning out into filthy yards. The serum alone cannot possibly cause cholera; and if a sufficient dose of serum is given, healthy hogs are not injured by the serum-simultaneous method.

Care of Hogs before Vaccinating.—Before vaccinating, cut down the rations for two or three days, feeding very little corn. Keep the animals clean and in dry, comfortable quarters, free from dust, and, if possible, in disinfected pens. If the weather is favourable, a dipping is advisable a few days before vaccinating.

Treatment after Vaccinating.—From the fact that there is always more or less fever caused by vaccinating, and more or less danger of the animal becoming infected through the wound made by the needle, the following after-treatment would suggest itself:—Spare diet for three or four days; very little corn, but plenty of water; thoroughly clean and comfortable pens; an abundance of clean bedding with absolutely no chance to get into mud or draught of any kind. The more mud and dust, the more danger. Hogs should not be dipped or operated upon for several weeks after vaccination.

[TO BE CONTINUED.]

Vegetable Pathology.

INSECTS FOR CHECKING GROWTH OR DISSEMINATION OF LANTANA.

BY HENRY TRYON, Government Entomologist and Vegetable Pathologist.

1ST MEMORANDUM.

Insects endowed with these habits occur in Mexico, where they were formerly found by my friend, Albert Koebele, in 1902.

The famous entomologist named, moreover, was instrumental in introducing living examples of several of these into the Sandwich Islands, where they have since become established.

(A)—Of these, two operate by preventing dissemination in the ordinary way—*i.e.*, by the seed.

These are a small fly named *Agromyza* and a small moth named *Pterophorus*; and of them the former effect this end by gradually destroying the seed of individual fruits when in the maggot condition, the latter by consuming the base of the flower, and so the parts going to form the seed.

Accordingly, where they have become prevalent either no fruit at all is formed, or, if this happen, it is small and defective in character.

I have been assured that under the influence of these insects lantana in Hawaii will not spread, although plants already established will persist.

(B)—In addition to the insects acting as described, there are other Mexican insects introduced to Hawaii that operate on the foliage. Of these the more important are a small moth (*Lithocolletis*) whose caterpillar mines therein, and a leaf sucker (*Teleonemia lantanæ*) that drains them of their cell sap.

These leaf-injuring insects do not destroy the lantana plant, but merely check its growth. This action on their part has been thus described:—"When in September, 1908, I went from Honolulu to nearly Mount Tantalus, I had occasion to see everywhere on the sides of the mountain, before arriving at the native forest, more or less extended areas completely overrun by lantana which was almost entirely without leaves and without flowers" (Dr. Silvestri—Translation).

The talented observer, from one of whose reports this statement is extracted, however, writes as follows: —

"This method [of coping with lantana—H.T.] presents a very grave danger, to avoid which exceptional and able caution is necessary, because only such insect species must be introduced as have very specialised habits [*i.e.*, have an exclusive appetite for the lantana, as have the *Agromyza and Pterophorus, i.e.*, the seed destroyers—H.T.] which almost certainly will not be able to adapt themselves suddenly and produce the same changes in plants of other species.

"But when it is a question of insects which eat or mine the leaves or sucking insects, prudence demands a very accurate study, because it might happen that they, when transported to other regions, would adapt themselves to other plants [*i.e.*, other than the lantana—H.T.] and then it would become necessary to have recourse to the introduction of their parasites, with much probability but without certainty of their efficacy in the new home" (Silvestri).

It may be added, however, that the authorities of New Caledonia have shown that they are prepared to take the risk of injury arising from the importation of these lantana-injuring insects that Dr. Silvestri thus refers to.

Personally, I conceive very little objection—if any—in the introduction here of the seed-eating *Agromyza*.

I must, however, point out that there are in Hawaii lantana-loving insects that are not exclusively attached to this plant—for instance, the general feeder, *Orthezia insignis*; others, also, whose character in this connection is somewhat suspicious. And in introducing the better, care would have to be taken lest also the indifferent or bad are, too, similarly brought here; a very easy thing to be accidentally accomplished, especially if such undesirable insects happened to be in the egg state when transported.

The introduction to Queensland of insects such as these under very especial entomological safeguards is a work that this office, if properly started, could easily undertake. It is wholly impracticable under present circumstances; but, in any case, it would be necessary, before entertaining any proposal of the kind, that a local investigation be instituted at Hawaii by one possessed of the proper knowledge to look into a matter, presenting certain technical difficulties as it does.

21st September, 1910.

2ND MEMORANDUM.

In a Second Memorandum on the above subject, dated October, 1912, Mr. Tryon says:—

The expediency of taking measures to check the growth or dissemination of the weed "lantana" is a matter that is not within my province to decide.

The estimation in which it is held in other countries (*e.g.*, Ceylon) as an ameliorator of agricultural lands is well known; and I find our own Agricultural Chemist writing—as recently as September, 1912—as follows:—

"Exhausted sugar lands may be worked up again after lying idle for a few years and allowing lantana to grow, which acts as a very valuable green-manure crop, accumulating more particularly large amounts of potash."—*Queensland Agricultural Journal*, September, 1912, page 246.

And in a still later memoir *in the Press,* and a proof of which he has shown me—he states that the ash of this plant has been found by him to contain 13·96 per cent. of potash, 3·57 per cent. of phosphoric acid, and 16·95 per cent. of lime—ingredients that would bestow upon it a value of £4 4s. a ton, when compared with other fertilisers.

And he informs me, moreover, that its value as a cover-plant has been amply demonstrated at Mackay, as his own personal observations have led him to conclude.

The rôle of lantana as a weed interfering with certain purposes to which land may be put is, on the other hand, notorious.

Amongst complaints relating to its action in this respect, and the obligation, therefore, to eradicate it, may be mentioned ones made by the Barron Shire Council, on 11th May, 1909 (3795-09), and on 13th September, 1910 (6890-10).

These are now referred to, since they, moreover, raise the question of coping with it through the agency of "some parasite or disease." "If a parasite can be found whereby lantana can be successfully destroyed, it would be the means of saving a very large expenditure throughout this district, where it is necessary to eradicate it by the slow method of uprooting," to quote the words of one of them

Accordingly, on this matter having been referred to this office, I had the honour to address you on 21st September, 1910 (10-6890) a special Memorandum—

"*Insects for Checking Growth or Dissemination of Lantana.*"

In this I pointed out—

(1) That there were insects that consumed in the one case the foliage and in the other case the reproductive organs (seeds, &c.) of this plant, and so were capable of destroying it and preventing its spreading.

(2) That they had been introduced for lantana-subjugating purposes to the Hawaiian Islands, and were proving very effective there for this work.

(3) Also, that the services of a small fly—*Agromyza* sp., whose maggot exclusively fed upon the seed—were very noteworthy in this respect.

(4) That "I conceived very little objection—if any—to the introduction here" of it; and, in conclusion,

(5) That it was quite practicable for this office to introduce insects such as these (including especially the Agromyzid fly) under special entomological safeguards to Queensland.

Further, my inquiries preliminary to making these statements having been very wide, I referred to a recent decision on the part of the New Caledonia authorities to introduce these lantana-destroying insects into "La Belle Isle," where the repression of their pest plant, too, had appealed to them as desirable.

I have now to supplement the Memorandum referred to by a second one, in which I will narrate, for your information, the steps that were taken in New Caledonia in pursuance of this project, that they may be repeated for Queensland, should it be decided to utilise the services of insects in dealing with lantana also.

The Chamber of Agriculture (a body largely controlled by Government nominees on its executive, and subsidised by the Administration), on 1st June, 1910, decided to invite subscriptions—(1) For the purpose of sending a New Caledonian to the Hawaiian Islands to obtain the Agromyzid fly referred to; and (2) for providing premiums to be paid on the transference of this insect to New Caledonia in a living state, and on its becoming established there, after the expiration of a year from this event.

This invitation was readily complied with.

In the meantime, it had heard from the Planters' Association of the Hawaiian Island that the work would necessitate the concurrence of five entomologists and occupy a year, annual salaries of between 2,000 and 3,000 dollars being provided. (Letter of 13th October, 1910.)

The decision to nominate an emissary to the Sandwich Islands for the purpose of this work was made in May, 1911; and Dr. Lebœuf was accordingly commissioned by the Governor of New Caledonia to carry out this work, and left Noumea for the purpose on 17th August.

Having arrived at the Hawaiian Islands on 11th September, he lost no time in getting into touch with the local entomologists, and made inquiries that were favourable to the importation of the *Agromyza* to New Caledonia.

And already, on 23rd October, after having first cabled for a special steamer to be dispatched for him from New Caledonia, to facilitate the prompt conveyance of his insect charge, he had returned to Noumea with nearly a thousand living Agromyzed flies.

Whilst at Honolulu, Dr. Lebœuf studied not only the life history of the parasite, but observed that at least 90 per cent. of the lantana seed there was parasitized, and so destroyed, by the insect.

He found, however—as was previously known—that the most effective lantana-destroying insect there—the hemipteron *Orthezia insignis*—was a general feeder, and harmful to several cultivated plants, as well as to this weed, and, therefore, he took special measures to prevent its accidental transference to Noumea whilst transferring thither the Agromyzed fly and other insects.

His method of transferring the insects, which differed from that counselled by the Hawaiian experts, may best be described in his own words:—

> "Dans de larges bocaux, garnis de mousses aquatiques à réaction légèrement acide, empêchant le développement des moissures, j'ai déposé des bares parasiteés de lantana. Ces bocaux recouverts de tulle très fin, ont été soumis pendent le cours du trajet d'Honolulu â Nouméa, â une ventilation active. J'ai ainsi pu éviter les moissures au passage l'équateur qu' a été particulierement humide."

Sugar and water was used as provision for the sustenance of the flies in hatching out from the lantana fruit.

Shortly after his arrival at Noumea, he liberated about half of these Agromyzed parasites that he had conveyed thither, and kept the remainder under observation in a special insectory in which lantana plants had been established.

At the outset it was considered, however, by him that the higher rainfall and humidity of New Caledonia, as compared with the climate of the Sandwich Islands, would be less favourable to the insect in the former than in the latter region.

However, in March of the present year, Dr. Lebœuf was able to certify that already the lantana plants in the neighbourhood of Noumea had their seeds attacked by the *Agromyza* extensively, that it was reproducing itself as actively as it did in Honolulu, that its general distribution would be undertaken within a few weeks, its acclimatisation in New Caledonia having been accomplished.

In June, 1912, the secretary of the Chamber of Agriculture stated that agromyza-infected lantana was to be met with everywhere about Noumea, and provision was being made to distribute the insect generally to settlers, it being possible to raise the fly from berries simply enclosed in bottles.

It is gratifying to have to record the success of this mission, which has been watched with some interest by this office, as was the original and more difficult undertaking of conveying the lantana-destroying insects originally, from Mexico to Honolulu.

It is understood that Mr. Daniel Jones, formerly one of our officers, has recently visited New Caledonia, and can confirm what is alleged.

DISEASE OF THE PASSION VINE.

Mr. H. Tryon, Vegetable Pathologist, at the request of the Minister of Agriculture, has submitted the following preliminary report on the nature and origin of a disease affecting the Passion Vines (*Passiflora edulis*), in the Cleveland district, based on observations made at Cleveland.

The malady has for its main symptoms the gradual shedding of the foliage, and the shrivelling of the fruit, if present before ripening has taken place, and—ultimately—the dying back of the main "vines" from their extremities.

This shedding of the foliage, that determines to a great extent the other features, is caused immediately by the growth of a parasite fungus, belonging to the genus *Helminthosporium,* thereon.

This growth is restricted to spots, at first of a yellowish colour, ultimately becoming light mahogany—brown—that occur isolately either

within the margin of the leaf, along this, or at the apex. Generally these spots are defined by a yellowish halo; and have their central parts paler and at times almost white. Sometimes the same kinds of spots are met with also on the green fruit. The parasite referred to, and that not only is met with in connection with these spots, but also occasions them, can be seen—when it has attained its reproductive stage—within the light-coloured portion of each, where it forms a dark-hued dust-like substance. One or more of these blotches—that measure from 5 to 20 mm. in length—will be found on every fallen leaf, although they are more evident on those about to fall.

The dried terminals, that arise as the condition of die-back is attained, harbour a second fungus, a species of *Phoma*, but, although the species of this genus are generally found to be pathogenic for plant-life, there are grounds for concluding that this one is not living the life of a destructive parasite.

In instances of this disease that have come under our notice it would appear that an important contributing cause is found in the conditions of growth—in fact, it is doubtful if the leaf-parasite mentioned would act very prejudicially at all were the proper cultural requirements of the plants attended to. It is a common practice, apparently, to set the passion vines in their places and leave them thenceforth to care for themselves, furnishing them only with some kind of support for their rampant branches. The passion vine is a plant that evidently make great demands on the soil, and requires of this proper food and physical conditions for its widely extending root-system.

The leaf spots arise immediately from the growth of the spores or seeds of the *Helminthosporium* on the foliage, and the penetration of their germ-tubes, formed in the course of their growth, within its tissues. These spores are formed on the spots referred to especially after the leaves have fallen; and are carried by the wind into the leaves, where they are induced to sprout by moisture occurring therein.

In view, therefore, of these facts, it is desirable, if the trouble is to be overcome, to proceed as follows:—

1. Adopt, at every stage of the plant's growth, the proper course that horticultural considerations suggest should be complied with at that stage. (A special pamphlet on the care and cultivation of the passion vine, emanating from the Instructor in Fruit Culture, would be very helpful in this connection.)

2. Rake up from time to time and burn all fallen leaves, especially whilst they are still damp. Similarly, get rid of all vines that have succumbed, or are about to do so—as well as sick plants as a whole.

3. Spraying the foliage from time to time with Bordeaux mixture, made of 4-60-4 strength—*i.e.*, 4 lb. of copper sulphate, 60 gallons of water, and 4 lb. of lime—or these in like proportions.

Chemistry.

SOILS OF THE STANTHORPE DISTRICT.

By J. C. BRÜNNICH and G. R. PATTEN.

The belt of granitic soils of Southern Queensland, adjoining the New South Wales border, approximately 50 miles in length, with a breadth of about 10 miles, is situated at an elevation from 2,300 to 3,000 feet above the sea level, and has an average annual rainfall of about 28 inches.

The country is much broken and in places covered with outcrops of granitic boulders, but all along the slopes of the ranges, between the ridges and along the creek flats exist large areas of coarse to fine sandy granitic soils, which are eminently suited for the culture of deciduous fruits. The soils on the creeks, which are of an alluvial nature, but still granitic, contain generally a little more clay and humus, and are, besides fruit growing, particularly suited for the culture of vegetables, such as cabbages, tomatoes, potatoes, &c.

The soils vary in their chemical composition, but are, on the whole, easy to work, are naturally drained, and retain the moisture very well.

Some extravagant ideas about the composition of these soils exist, and the fertility is generally attributed to large amounts of potash, amounts of potash up to 16 per cent. being mentioned, but, as a matter of fact, none of the soils will contain more than 5 per cent. of potash, the bulk of which is in a most insoluble and unavailable form.

The soils must be classed as rather deficient in available plant foods, and their fertility, as proved by the excellent crops obtained, is chiefly due to the physical conditions, which promote a vigorous development of the root system of trees, and enable the soil to retain a large amount of moisture. There can be no doubt, however, that this fertility will be gradually reduced by exhaustion of the soil unless a proper system of cultivation, combined with manuring, is practised, as more particularly the amounts of humus, nitrogen, and lime in the soil are exceedingly low.

Inspector J. Henderson, who is stationed in the district, collected soil samples for analysis, giving full particulars and descriptions of each locality. The places where the samples were taken are indicated on the attached map of the district.

The results of our investigations, physical properties, mechanical and chemical analyses are given on the attached Tables I. and II. In all cases the analyses refer to samples of soil taken to a depth of 24 in., and subsoil taken to 48 in. The amounts of plant foods in lbs. per acre,

however, are calculated, as it is our general practice, for a depth of 12 in. only. The actual layers of top soil, in most cases, as will be seen from details on Table I., amount to really only 5 to 14 in., so that our samples of soil include some of the subsoil. In most cases no sharp line of demarcation between the soil and subsoil exists, but the one gradually changes into the other.

In order to make the investigation more complete, besides the usual agricultural analysis [extraction of the soil with hydrochloric acid, the determination of available plant foods, extraction with weak citric acid solution], in some cases a complete analysis of the insoluble residue was carried out. It is particularly interesting to compare the analyses of these residues with an analysis of a piece of granite from Stanthorpe. A comparison clearly shows that in the soil the soda and lime felspars have been largely decomposed, the lime and soda leached out of the ground, whereas the potash felspar remained practically unaltered and leaving from 2·3 to 4·8 per cent. of potash in this residue. Only Soil 336 (No. 10 on map) contains a fairly large amount of lime, and for this reason cherry trees do fairly well, whereas everywhere else cherry trees do not give good results.

Analysis of Granite.

	Per cent.
Silica	76·19
Alumina	11·53
Ferro oxide	·84
Ferrous oxide	1·25
Magnesia	·60
Lime	1·14
Soda	3·80
Potash	4·14
Manganous oxide	·16
Titanium oxide	·09
Phosphoric acid	·25
Water (at 100° C.)	Nil
Loss on ignition	·28
	100·27

The mechanical analyses of the soils indicate in some cases fairly large amounts of "clay," but this clay evidently consists chiefly of finely ground particles of felspar, and contains but little actual kaolin.

DESCRIPTION OF LOCALITIES where soil examples were taken.

No. on Map, **1**; *No. of Analysis,* 177/8.—Portion 28v, parish of Stanthorpe, 2 miles W. from railway; forest land, heavily timbered with stringy bark; virgin soil on flat ridge, naturally drained.

Fairly large areas of similar country occur along the range between Dalveen and Wallangarra.

The composition of this soil is below the average of the district with regard to phosphoric acid, lime, and potash.

No. on Map, **2**; *No. of Analysis,* 183/4.—Portion 108, parish of Stanthorpe, close to Thulimbah Railway Station; forest land, stringy bark, box, peppermint, and red gum; virgin soil, flat and slightly undulating, with natural drainage.

Fairly large areas of similar country exist along the slopes of the range between Thulimbah and Wallangarra.

This soil comes close to the average composition of the soils, and contains much more available lime than the previous sample.

No. on Map, **3**; *No. of Analysis,* 181/2. Portion 35, parish of Stanthorpe, ½ mile W. of railway; forest land; similar to No. 2; under cultivation for one year with apples; slightly undulating, dry, and undrained.

This soil is of different nature, more clayey than the two previous samples, contains more iron and alumina, and much less potash in the insoluble residue. The amount of phosphoric acid is high and readily available.

No. on Map, **4**; *No. of Analysis* 334/5.—Portion 43v, parish of Stanthorpe, about 2 miles W. of railway; forest, with stringy bark, box, apple, and honeysuckle; virgin soil, flats surrounded by mountains, naturally drained.

This soil is considerably below the average analysis, more particularly deficient in nitrogen.

No. on Map, **5**; *No. of Analysis,* 328/9.—Portion 379, parish of Broadwater, ½ mile from railway; forest land; under cultivation for eight years; naturally drained; was manured with sheep manure for two years; the eight-year-old fruit trees are affected with disease known as "die-back" or "gumming."

The soil is slightly below the average, deficient in humus, lime, and other plant foods, and will require a general artificial manure, combined with liming.

No. on Map, **6**; *No. of Analysis,* 179/180.—Portion 20v, parish of Marsh, 4½ miles W. from railway; forest, with stringy bark, box, peppermint, and red gum; under cultivation for one year; trees healthy.

The composition of this soil is below the average with regard to humus and phosphoric acid; above the average in its contents of total potash, but very low again in available potash, which is the lowest of all the soils analysed.

No. on Map, **7**; *No. of Analysis*, 406/7.—Portion 84v, parish of Folkestone, about 10 miles E. of railway; forest, with stringy bark, apple, and honeysuckle; under cultivation for fourteen years.

Large areas of similar country exist in the neighbourhood.

The composition of the soil is considerably below the average composition with regard to total amounts of plant foods, but contains them in a fairly available form.

No. on Map, **8**; *No. of Analysis*, 326/7.—Portion 38v, parish of Broadwater, about ½-mile W. of railway; forest land on the mountain side, with fair slope; naturally drained, and cultivated for seven years; under apples, peaches, and vegetables.

Large areas of similar country exist on the slopes of the mountains in the district.

The composition of this soil shows distinct depletion in the amounts of lime, potash, and nitrogen.

No. on Map, **9**; *No. of Analysis*, 314/7.—Portion 2VA, parish of Broadwater, E. of railway; forest, with apple trees, peppermint, gums, and pine; trees ringbarked; virgin soil; naturally drained.

There is not much difference between the two samples; the first taken on the slope of the mountain, and the second from the ringbarked flat near gully.

The soils are above the average, contain more humus, and are comparatively rich in lime, and rich in available potash. Fruit trees and vegetables ought to do very well, and it is very probable that cherry trees would do better than anywhere else in the district.

No. on Map, **10**; *No. of Analysis*, 336/7.—Portion 6v, parish of Ballandean, about 2 miles W. of railway; forest land, with yellow box, gum, and swamp oak; for ten years under cultivation; apples, plums, cherries, and vegetables grown; cherries grow to perfection, but apples do not fruit well; cabbages do very well, but not potatoes.

Flats, naturally drained, a fair average of the whole country between Ballandean and Wyberba.

This soil is decidedly more clayey than others; contains a comparatively high amount of phosphoric acid, lime, and potash. Available phosphoric acid is much below average; available potash is also low; all showing distinct signs of depletion by cultivation. The orchard will require application of artificial fertilisers, and potatoes should also do well with manuring. The fairly high amount of lime in the soil, combined with its more clayey nature, must account for the fact that cherries do well, but even they will require artificial fertilisers to be kept in good heart.

CHEMICAL ANALYSES OF SOILS FROM STANTHORPE DISTRICT.

TABLE II.

Number on Map...	1.		2.		3.		4.		5.		6.	
Laboratory Number ...	177	178	183	184	181	182	334	335	328	329	179	180
	Soil.	Subsoil.	Soil.	Subsoil.	Soil.	Subsoil.	Soil.	Subsoil.	Soil.	Subsoil.	Soil.	Subsoil.
Reaction ...	Slightly acid.	Acid.	Neutral.	Slightly acid.	Slightly Acid.	Slightly Acid.	Neutral.	Neutral.	Slightly acid.	Slightly acid.	Slightly acid.	Acid.
Chemical Analyses of Soil.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Moisture ...	1·88	1·14	·88	·98	2·00	4.20	·88	·54	·56	1·02	1·60	1·42
Humus ...	·75	·30	·40	·20	1·25	·25	·65	·15	·55	·20	·25	·25
Other Organic Matter and Combined Water	6·39	6·18	1·24	2·34	4·81	7·81	·45	·37	·83	1·86	3·81	5·95
Chlorine ...	·003	·003	·008	·012	·004	·067	·004	·004	·005	·004	·004	·004
Nitrogen ...	·059	·014	·035	·018	·033	·010	·021	·007	·031	·006	·035	·014

Number on Map / Laboratory Number	1. — 177 Soil.		1. — 178 Subsoil.		2. — 183 Soil.			2. — 184 Subsoil.	
	Hydrochloric Acid Extract—Total Elements.	Citric Acid Extract—Available Plant Food.	Hydrochloric Acid Extract—Total Elements	Citric Acid Extract—Available Plant Food.	Hydrochloric Acid Extract—Total Elements.	Citric Acid Extract—Available Plant Food.	CO_2 Water Extract—Available Plant Food.	Hydrochloric Acid Extract—Total Elements.	Citric Acid Extract—Available Plant Food.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Phosphoric Acid ...	·016	·0056	·022	·0028	·040	·0028	·0008	·053	·0057
Lime ...	·082	·0138	·092	·0124	·104	·0392	·0013	·071	·0130
Magnesia ...	·081	...	·076	...	·045	...	...	·078	...
Potash ...	·022	·0065	·039	·0033	·042	·0064	·0020	·065	·0095
Insoluble Residue in Hydrochloric Acid	82·72	...	77·20	...	95·22	...	...	91·21	...
Lb. per acre of plant food to 12 in. in depth.	Total Elements.	Available Plant Food.	Total Elements.	Available Plant Food.	Total Elements.	Available Plant Food.	Available Plant Food.	Total Elements.	Available Plant Food.
Phosphoric Acid ...	565	198	802	102	1,664	116	33	2,234	240
Lime ...	2,899	488	3,352	452	4,327	1,631	54	2,992	548
Potash ...	820	230	1,421	120	1,747	266	83	2,740	400
Nitrogen ...	2,085	...	510	...	1,456	...	...	759	...

Number on Map / Laboratory Number	3. — 181 Soil.			3. — 182 Subsoil.		4. — 334 Soil.		4. — 335 Subsoil.	
	Hydrochloric Acid Extract—Total Elements.	Citric Acid Extract—Available Plant Food.	CO_2 Water Extract—Available Plant Food.	Hydrochloric Acid Extract—Total Elements.	Citric Acid Extract—Available Plant Food.	Hydrochloric Acid Extract—Total Elements.	Citric Acid Extract—Available Plant Food.	Hydrochloric Acid Extract—Total Elements.	Citric Acid Extract—Available Plant Food.
	Per cent.	Per cent.	Per cent.	Per cent	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Phosphoric Acid ...	·115	0105	0019	·173	·0038	·041	·0074	·020	·0028
Lime ...	·097	·0254	·0013	·064	·0108	·080	·0384	·070	·0112
Magnesia ...	·078	...	...	·053	...	·026	...	·027	...
Potash ...	·052	·0090	·0024	·087	·0069	·033	·0081	·030	·0056
Insoluble Residue in Hydrochloric Acid	78·82	...	...	64·87	...	96·54	...	97·29	...
Lb. per acre of plant food to 12 in. in depth.	Total Elements.	Available Plant Food.	Available Plant Food.	Total Elements.	Available Plant Food.	Total Elements.	Available Plant Food.	Total Elements.	Available Plant Food.
Phosphoric Acid ...	4,035	368	67	5,834	128	1,628	293	925	129
Lime ...	3,403	891	46	2,158	364	3,176	1,524	3,236	518
Potash ...	1,824	316	84	2,934	233	1,310	322	1,387	259
Nitrogen ...	1,158	...	...	337	...	834	...	324	...

Number on Map / Laboratory Number	5. — 328 Soil.		5. — 329 Subsoil.		6. — 179 Soil.		6. — 180 Subsoil.	
	Hydrochloric Acid Extract—Total Elements.	Citric Acid Extract—Available Plant Food.	Hydrochloric Acid Extract—Total Elements.	Citric Acid Extract—Available Plant Food.	Hydrochloric Acid Extract—Total Elements.	Citric Acid Extract—Available Plant Food.	Hydrochloric Acid Extract—Total Elements.	Citric Acid Extract—Available Plant Food.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Phosphoric Acid ...	·055	·0053	·043	·0010	·045	·0022	·022	·0008
Lime ...	·087	·0284	·062	·0108	·112	·0270	·117	·0170
Magnesia ...	·033	...	·068	...	·193	...	·262	...
Potash ...	·055	·0073	·051	·0040	·174	·0026	·164	·0023
Insoluble Residue in Hydrochloric Acid	96·31	...	89·15	...	84·15	...	76·35	...
Lb. per acre of plant food to 12 in. in depth.	Total Elements.	Available Plant Food.	Total Elements.	Available Plant Food.	Total Elements.	Available Plant Food.	Total Elements.	Available Plant Food.
Phosphoric Acid ...	2,378	229	1,731	40	1,762	86	772	28
Lime ...	3,762	1,228	2,495	435	4,386	1,057	4,105	596
Potash ...	2,378	316	2,053	161	6,814	102	5,753	81
Nitrogen ...	1,340	...	241	...	1,370	...	491	...

	Analysis of Insoluble Residue of Soil—183.		Analysis of Insoluble Residue of Soil—181.		Analysis of Insoluble Residue of Soil—328.	
	Soluble in Sulphuric Acid.	Soluble in Hydrofluoric Acid.	Soluble in Sulphuric Acid.	Soluble in Hydrofluoric Acid.	Soluble in Sulphuric Acid.	Soluble in Hydrofluoric Acid.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Silicia ...	2·440	...	9·600	...	1·990	...
Iron and Alumina ..	·695	2·704	2·110	3·580	·490	·304
Lime ...	·100	·208	·090	·280	·090	·240
Magnesia ...	·036	·046	·051	·112	·036	·107
Potash ...	·065	4·740	·120	2·304	·089	4·780
Soda ...	·232	·915	·144	·619	·315	1·460

Mineral Composition—	Soil—183	Soil—181	Soil—328
	Per cent.	Per cent.	Per cent.
Clay ...	3·563	12·115	3·010
Felspars ...	36·849 {28·1 Potash felsp., 7·7 Soda felsp., 1·0 Lime felsp.}	20·271 {13·6 Potash felsp., 5·2 Soda felsp., 1·4 Lime felsp.}	41·844 {28·3 Potash felsp., 12·4 Soda felsp., 1·2 Lime felsp.}
Mica ...	·154	·375	·359
Quartz ...	54·653	46·059	51·097

ANALYSES OF SOILS FROM STANTHORPE DISTRICT.

TABLE I.

PHYSICAL PROPERTIES AND MECHANICAL ANALYSES.

Number on Map	1.		2.		3.		4.		5.	
Laboratory Number	177.	178.	183.	184.	181.	182.	334.	335.	328.	329.
Locality	South-west Corner of Portion 28v		South-west Corner of Portion 108		Crown of flat ridge, Portion 35		Portion 43v		Centre of Portion 379 ...	
Parish	Stanthorpe		Stanthorpe		Stanthorpe		Stanthorpe		Broadwater	
Description of Soil in the Field	8″ deep. Gray sandy loam 24″ ,, Light clay 48″ ,, Sandy clay		8″ deep. Light grey sandy loam 24″ ,, Sand 48″ ,, Sand		6″ deep. Light grey sandy loam 24″ ,, Light grey clayey soil 48″ ,, Reddish grey clay		6″ deep. Ligh sandy soil 24″ ,, Coare sand ... 48″ ,, Coare sand and gnvel		10″ deep. Light sandy loam 22½″ ,, Sand ... ... 36″ ,, Cement bed ...	
Description of Soil after Analyses. [Soil taken to 24″ in depth and subsoil to 48″.]	Medium Sandy Clay.	Sandy Clay.	Coarse Sandy Soil.	Coarse Sandy Soil.	Medium Sandy Clay.	Sandy Clay.	Coarse Sandy Soil.	Coarse Sandy Soil.	Coarse Sandy Soil.	Sandy Clay.
—	Soil.	Subsoil.	Soil.	Subsoil.	Soil.	Subsoil.	Soil.	Subsoil.	Soil.	Subsoil.
Properties of the Soil.										
Reaction	Slightly Acid.	Acid.	Neutral.	Slightly Acid.	Slightly Acid.	Slightly Acid.	Neutral.	Neutral.	Slightly Acid.	Slightly Acid.
Apparent Specific Gravity ...	1·30	1·34	1·53	1·55	1·29	1·24	1·46	1·70	1·59	1·48
Weight of Soil per Acre, 12″ deep, tons	1,578	1,627	1,857	1,882	1,566	1,505	1,772	2,064	1,930	1,797
Capacity for Water, per cent. ...	33·5	38·5	26·7	26·9	37·8	45·3	25·2	21·8	22·0	29·3
Absorbed Weight per Acre, 12″ deep, tons	528	626	496	506	592	681	46·6	450	424	526
Capillarity in inches after 3 hours	7½	11	8	8	8	8½	10	9½	9	11½
6 ,,	8	12½	9½	9	9	12	11½	12½	11	13¾
24 ,,	9½	15	13	12½	12½	17	16	19	16½	20½
48 ,,	10½	17	14¾	15¼	14¾	19	18½	23½	20	24½
Mechanical Analyses.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Fine Gravel	7·41	13·95	27·35	18·68	18·43	9·57	37·79	32·29	19·88	6·81
Coarse Sand	17·29	21·77	21·86	18·71	17·07	13·05	25·74	27·71	19·01	12·99
Medium Sand	31·14	18·49	26·72	23·92	16·05	12·48	17·39	22·23	26·34	21·95
Fine Sand	7·71	2·13	3·26	8·75	7·37	7·19	5·91	7·63	11·59	14·42
Silt	4·63	1·14	4·16	7·78	2·84	5·42	3·58	3·38	7·47	11·81
Fine Silt	trace	trace	trace	·42	5·49	·62	·43	·95	1·19	1·48
Clay	22·80	34·60	14·13	18·22	24·69	39·41	7·18	4·75	12·58	27·46
Organic Matter and Water ...	9·02	7·92	2·52	3·52	8·06	12·26	1·98	1·06	1·94	3·08

Number on Map	6.		7.		8.		9.		9.		10.	
Laboratory Number	179.	180.	406.	407.	326.	327.	314.	315.	316.	317.	336.	337.
Locality	Crown of Flat Ridge of Portion of 20v		Portion 84v		South side of Portion 38v ...		Portion 2vA (1)		Portion 2vA (2)		Portion 6v	
Parish	March		Folkstone		Broadwater		Broadwater		Broadwater		Ballandean	
Description of Soil in the Field	5″ deep. Light sandy loam 24″ ,, Sandy soil ... 27″ ,, Clayey, with a granite bed		14″ deep. Grey sandy loam 24″ ,, Fine sand ... 48″ ,, Medium coarse sand		8″ deep. Light grey sandy loam 24″ ,, Light sand ... 48″ ,, Sandy gravel ...		8″ deep. Grey sandy loam 24″ ,, Sand ... ... 30″ ,, Sand		12″ deep. Light grey sandy loam 24″ ,, Sand ... ... 30″ ,, Sand		7″ deep. Dark sandy loam. 24″ ,, Sandy soil. 36″ ,, Coarse sand and ironstone. 37″ ,, Gravel bed.	
Description of Soil after Analyses. [Soil taken to 24″ in depth and subsoil to 48″.]	Medium Sandy Clay.	Medium Sandy Clay.	Coarse Sandy Soil.	Coarse Sandy Soil.	Coarse Sandy Soil.	Coarse Sandy Soil.	Medium Sandy Soil.	Medium Sandy Soil.	Coarse Sandy Soil.	Coarse Sandy Soil.	Medium Sandy Clay.	Medium Sandy Soil.
—	Soil.	Subsoil.	Soil.	Subsoil.	Soil.	Subsoil.	Soil.	Subsoil.	Soil.	Subsoil.	Soil.	Subsoil.
Properties of the Soil.												
Reaction	Slightly Acid.	Acid.	Slightly Acid.	Neutral.	Slightly Acid.	Slightly Acid.	Neutral.	Neutral.	Neutral.	Neutral.	Slightly Acid.	Neutral.
Apparent Specific Gravity ...	1·44	1·29	1·55	1·49	1·65	1·76	1·65	1·70	1·69	1·78	1·51	1·40
Weight of Soil per Acre, 12″ deep, tons	1,748	1,566	1,882	1,809	2,003	2,137	2,003	2,064	2,052	2,161	1,833	1,700
Capacity for Water, per cent. ...	35·0	32·5	30·0	18·9	24·6	22·5	24·8	19·8	25·5	19·8	29·2	28·0
Absorbed Weight per Acre, 12″ deep, tons	612	509	564	342	492	481	496	408	523	428	535	466
Capillarity in inches after 3 hours	6½	9½	11½	13	12	12½	9½	9½	8	8	8½	11¼
6 ,,	9	11½	13½	14	14½	15	12	12	11	10	11	13¼
24 ,,	11½	15	16½	15¾	19½	21¾	18½	17½	17½	15	18	17¼
48 ,,	14	18½	17½	17	21¼	26¼	22½	21	22	17½	21¾	19¼
Mechanical Analyses.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Fine Gravel	16·94	17·29	12·82	14·13	16·03	14·29	15·53	10·40	18·09	36 63	4·97	13·36
Coarse Sand	14·19	18·87	20·11	16·49	20·33	20·24	14·11	17·02	15·38	21·57	12·23	22·77
Medium Sand	19·78	17·88	45·81	50·92	35·71	35·59	29 66	35·14	29·88	18·17	28·97	38·96
Fine Sand	11·50	8·43	10·38	10·59	14·41	15·19	13 02	15·43	13·75	·76	18·10	8·88
Silt	4·30	4·72	2·33	·76	2·45	5·01	7·56	6·00	9·14	·41	10·66	·94
Fine Silt	·14	·21	·36	·38	·32	·48	1·08	1·06	1·58	trace	1·20	·58
Clay	27·49	24·98	5·35	4·69	9·31	7·78	16·38	13·54	10·00	21·44	20·57	12·13
Organic Matter and Water ...	5·66	7·62	2·84	2·04	1·44	1·42	2·66	1·41	2·18	1·02	3·30	2·38

CHEMICAL ANALYSES OF SOILS FROM STANTHORPE DISTRICT—*continued.*

Number on Map ...	7.		8.		9.		9.		10.		Average Analysis of Eleven Samples.	
Laboratory Number ...	406.	407.	326.	327.	314.	315.	316.	317.	336.	337.		
	Soil.	Subsoil.	Soil.	Subsoil.	Soil. (1)	Subsoil.	Soil. (2)	Subsoil.	Soil.	Subsoil.	Soil.	Subsoil.
Reaction	Slightly Acid.	Neutral.	Slightly Acid.	Slightly Acid.	Neutral.	Neutral.	Neutral.	Neutral.	Slightly Acid.	Neutral.	...	...
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Moisture	·14	·14	·30	·80	·40	·30	·30	·22	1·70	1·30	·96	1·10
Humus	·45	·10	·35	·15	·75	·15	·70	·15	·40	·20	·59	·19
Other Organic Matter and Combined Water	2·25	1·80	·79	·47	1·51	·95	1·18	·65	1·20	·88	2·22	2·60
Chlorine	·003	·003	·003	·005	·015	·006	·006	·014	·005	·005	·005	·006
Nitrogen	.020	·007	·015	·007	·039	·008	·016	·011	·031	·014	·033	·010

Chemical Analyses of Soil.

	406. Hydrochloric Acid Extract—Total Elements.	406. Citric Acid Extract—Available Plant Food.	407. Hydrochloric Acid Extract—Total Elements.	407. Citric Acid Extract—Available Plant Food.	326. Hydrochloric Acid Extract—Total Elements.	326. Citric Acid Extract—Available Plant Food.	327. Hydrochloric Acid Extract—Total Elements.	327. Citric Acid Extract—Available Plant Food.	314. Hydrochloric Acid Extract—Total Elements.	314. Citric Acid Extract—Available Plant Food.	315. Hydrochloric Acid Extract—Total Elements.	315. Citric Acid Extract—Available Plant Food.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Phosphoric Acid ...	·033	·0052	·040	·0041	·079	·0036	·047	·0029	·048	·0038	·051	·0022
Lime	·066	·0316	·052	·0184	·051	·0170	·036	·0094	·159	·0762	·059	·0182
Magnesia	·028	...	·022	...	·045	..	·042	...	·082	...	·051	...
Potash	·036	·0061	·036	·0027	·025	·0067	·030	·0073	·031	·0089	·034	·0093
Insoluble Residue in Hydrochloric Acid	97·62	...	97·46	...	96·58	...	96·64	...	94·91	...	95·59	...

	316. Hydrochloric Acid Extract—Total Elements.	316. Citric Acid Extract—Available Plant Food.	316. CO_2 Water Extract—Available Plant Food.	317. Hydrochloric Acid Extract—Total Elements.	317. Citric Acid Extract—Available Plant Food.	336. Hydrochloric Acid Extract—Total Elements.	336. Citric Acid Extract—Available Plant Food.	336. CO_2 Water Extract—Available Plant Food.	337. Hydrochloric Acid Extract—Total Elements.	337. Citric Acid Extract—Available Plant Food.	Average Soil. Hydrochloric Acid Extract—Total Elements.	Average Soil. Citric Acid Extract—Available Plant Food.	Average Subsoil. Hydrochloric Acid Extract—Total Elements.	Average Subsoil. Citric Acid Extract—Available Plant Food.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Phosphoric Acid ...	·067	·0043	·0008	·045	·0038	·143	·0023	·0025	·080	·0018	·062	·0048	·054	·0027
Lime	·180	·0586	·0054	·041	·0114	·127	·0296	·0045	·095	·0240	·104	·0350	·070	·0142
Magnesia	·072	...	..	·038	...	·130	...	...	·111	...	·074	...	·075	...
Potash	·027	·0100	·0046	·028	·0148	·149	·0051	·0019	·127	·0061	·059	·0070	·063	·0065
Insoluble Residue in Hydrochloric Acid	95·83	...	...	97·22	...	90·80	...	...	93·20	...	91·77	...	88·74	...

Lb. per acre of plant food to 12″ in depth.

	406. Total Elements.	406. Available Plant Food.	407. Total Elements.	407. Available Plant Food.	326. Total Elements.	326. Available Plant Food.	327. Total Elements.	327. Available Plant Food.	314. Total Elements.	314. Available Plant Food.	315. Total Elements.	315. Available Plant Food.
Phosphoric Acid ...	1,391	219	1,621	166	3,545	161	2,249	139	2,154	170	2,358	102
Lime	2,782	1,332	2,107	746	2,288	763	1,723	450	7,314	3,419	2,728	841
Potash	1,517	257	1,459	109	1,122	301	1,436	349	1,391	399	1,572	430
Nitrogen	843	...	284	...	673	...	335	...	1,750	...	370	...

	316. Total Elements.	316. Available Plant Food.	316. Available Plant Food.	317. Total Elements.	317. Available Plant Food.	336. Total Elements.	336. Available Plant Food.	336. Available Plant Food.	337. Total Elements.	337. Available Plant Food.	Average Soil. Total Elements.	Average Soil. Available Plant Food.	Average Subsoil. Total Elements.	Average Subsoil. Available Plant Food.
Phosphoric Acid ...	3,079	198	37	2,178	184	5,872	94	103	3,045	68	2,546	197	2,232	111
Lime	8.272	2,693	248	1,984	552	5,215	1,215	185	3,616	914	4,270	1,437	2,893	587
Potash	1,241	460	211	1,355	716	6,118	209	78	4,835	232	2,423	287	2,604	269
Nitrogen	2,114	...	...	532	...	1,273	...	...	533	...	1,355	...	413	

—	Analysis of Insoluble Residue of Soil, 316.		Analysis of Insoluble Residue of Soil, 336.	
	Soluble in Sulphuric Acid.	Soluble in Hydrofluoric Acid.	Soluble in Sulphuric Acid.	Soluble in Hydrofluoric Acid.
	Per cent.	Per cent.	Per cent.	Per cent.
Silica	1·640	...	4·860	...
Iron and Alumina ...	·453	·288	1·753	·184
Lime	·120	·320	·120	·600
Magnesia	·062	·087	·087	·029
Potash	·096	4·660	·218	3·290
Soda	·319	1·460	·302	2·300

Mineral Composition—	Soil, 316. Per cent.	Soil, 336. Per cent.
Clay	2·690	7·340
Felspars	41·532 {27·6 Potash felsp., 12·3 Soda ,, 1·6 Lime ,,}	41·922 {19·5 Potash felsp., 19·4 Soda ,, 3·0 Lime ,,}
Mica	·292	·097
Quartz	51·316	41·441

28° 30' S.
152° E.
Maryland
N
RANGE
GREAT DIVIDING
STANTHORPE
SUGARLOAF MT
MT TULLY
28° 45' S.
Bald Rock
CASTLE ROCK
MT NORMAN
TENTERFIELD

Entomology.

THE CATERPILLAR PLAGUE.

At two periods of the year (September—October and March—May) serious ravages are committed on pasturage and cereal crops, particularly barley, by caterpillars. These caterpillars are (says Mr. H. Tryon, Government Entomologist), the young of two night-flying moths. They are found not only in Australia and New Zealand, but also in Europe, Southern Asia, and North America. In the last-named region it bears the significant name of "army worm." It has many enemies. Not only do birds devour it, but it is also the prey of many carnivorous insects. It is, however, most effectually held in check by internal parasites and disease—both fungus and bacterial; and, moreover, special meteorological conditions determine the death of its eggs. Under ordinary circumstances, these factors prove competent to hold it entirely in subjection. The more numerous the insect, the more active and destructive are its enemies. Hence, it usually happens that a district is rarely visited in successive seasons by this pest, and, indeed, years may sometimes elapse between one visitation and another.

As far as remedies are concerned, the farmer should inspect his growing crop from time to time, especially early in August and February, and pull up here and there some of the ranker stools, and shake them well to discover the miniature caterpillars. It often happens that the whole area of a plot in crop is not simultaneously attacked, but different parts are visited successively; consequently, it will be found generally practicable to isolate the earlier infested portions, if narrow tracks are left intersecting the area under cultivation, to contain furrows or ditches along them. These ditches should be as deep as possible, and the sides made loose by dragging brush along them. This barrier is rendered still more effective by sprinkling coal tar or gas lime on the sides and bottom. At every 3 or 4 rods, a deep hole should be made in the ditch, in which the worms will collect, when they can be destroyed by covering them with earth or by burning straw over them.

Since it has been proved by experiment that the caterpillars will not eat fodder which has been moistened with a weak solution of sulphate of copper (bluestone), it may be advantageous to spray the crop with it. Too strong a solution would possibly result in the destruction of the plants. Farmers interested in caterpillar repression should make it their business to strenuously oppose the destruction of all insectivorous birds and their eggs.

The complete history, with illustrations, of the caterpillars will be found in the "Queensland Agricultural Journal," Vol. VI., February, 1900, by Hy. Tryon, Government Entomologist.

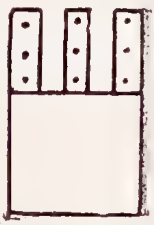
General Notes.

A HOME-MADE HORSE-GEAR.

Mr. C. A. Fredricksen, of Byrnestown, sends us the following plan and specification of a horse-gear manufactured by him out of bush timber, which he claims is very effective. He says:—

"It is very simple, and has worked without a hitch for over three years. It was made from some spare posts, and completed in three days, which includes all experimental work. Knowing what I now do, if the timber were ready, I could put one together in a day. Two years ago, in hackling broom millet, I got 700 revolutions on the hackler, by simply running a belt from the fly-wheel of the chaffcutter (which was running loose) to the pulley of the hackler. I put through about 10 cwt. per day, with two of the children to pass me the millet. With sufficient help, twice the quantity could easily have been put through.

" *Specification.*—Timber required: 8 slabs, 9 ft. long, 8 in. x 2 in.; 4 stays, 6 ft. long, 6 in. x 2 in.; 4 spreaders, 6 ft. long, 6 in. x 2 in.; 1 round post, 8 ft. long, 12 in., redwood, at the small end; 2 posts, 11 ft. long, 10 in. at small end; 1 top log, 31 ft. long, 6 in. at small end; 1 block, 4 ft. long, 12 in.; 1 horse lever, 14 ft. long. Ironwork: 1 chain, 1 in. links, ¼ in. thick, about 80 ft.—the length of the chain depends upon how far away the chaffcutter is placed; 4 cast-iron grooved pulley sheaves, 7 in. diameter, 1½ in. groove, to take 1½ pin or bolt; 4 bolts for same, 8 in. by 1½ in.; 2 bolts, same size, 18 in. long (1 bar of round iron 1½ in., 5 ft. 8 in., and cut in lengths to suit, will do); 2 rods of ½-in. iron, 6 ft. long, threaded at both ends; 8 bolts, 10 in. by ½ in.; 4 bolts, 5 in. by ½ in. The ironwork cost me only £1 12s., but I used a lot of old bolts I had about the place, and twisted No. 8 wire instead of the 6 ft. ½-in. rods. Mode of Construction: Take one of the 11-ft. long posts, place it in the wall of the barn, 3 ft. in the ground; but before placing it in position, saw out two pieces from the top downwards, 3 ft. long and 1½ in. wide. The top of the log will then look like this—



Bore horizontally right through the slot, at intervals of 6 in. This is for the tension pulleys, to allow them to be shifted up or down, as required. Next place the other 11-ft. log 30 ft. away, 3 ft. in the ground, but see that the tops of both are level and tenoned to take top log, which, after mortising and having bored 1½-in. hole in the very centre, place in position. Take a plumbob, drop it through the hole in the centre of the top log; where it touches the ground dig a hole 2 ft. 6 in. deep, and place the 4-ft. block in position; where the plumbob touches the block, bore a hole 1½ in. Take the 8-ft. centre log; mortice 8 holes, 6 in. from top, for the arms or spokes, 4 holes half-way down for stays. Bore 1½-in. holes in the centre of each end. Drive

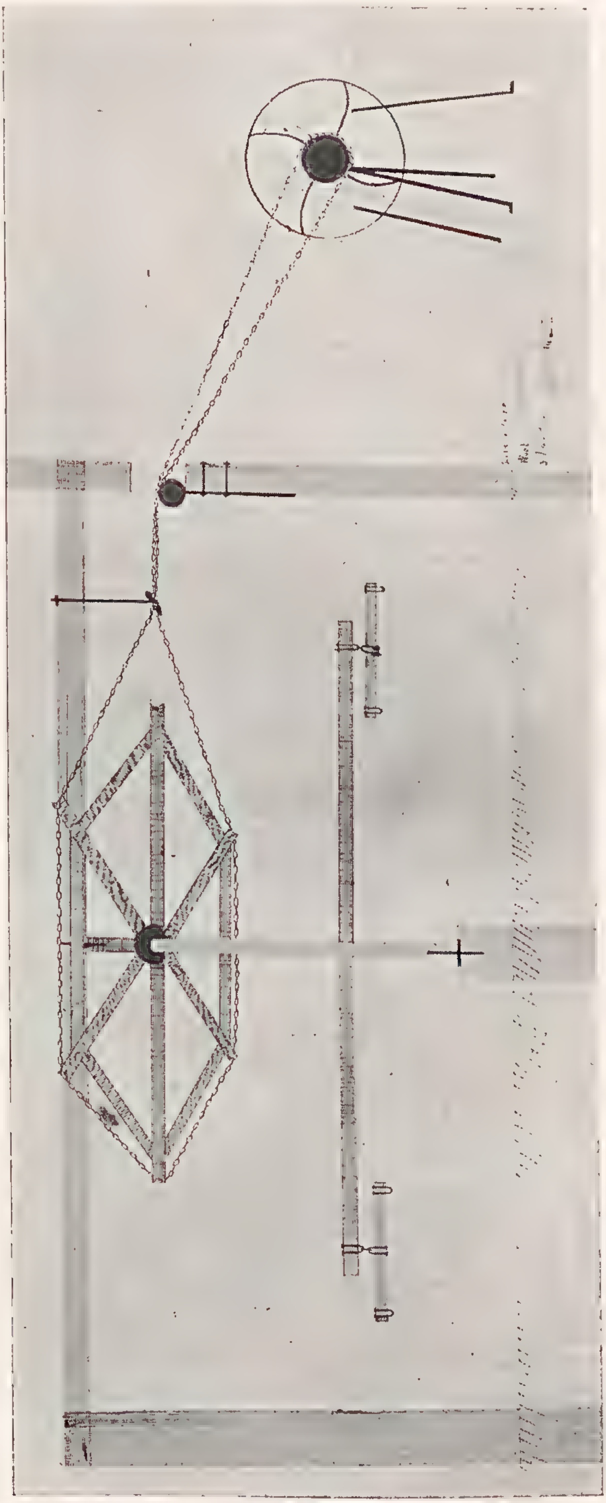
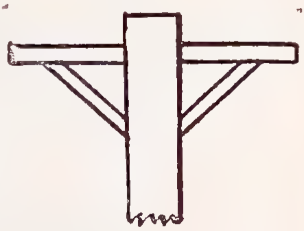


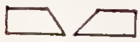
PLATE 53.—HOME-MADE HORSE-GEAR.

bottom bolt, 18 in. x $1\frac{1}{2}$ in., home; first having heated it and notched it to make it stay firm when driven in. Allow only 6 in. to project. Now lift the log into place, driving the top bolt home through the centre hole in the top log. Next place spokes in position, having first made a

-shaped cut in each of the outer ends, the bottom lip to project 7 or 8 in. more than the top. Make all secure with stays and spreaders, and bolt well together. Rim the two 6-ft. long $\frac{1}{2}$-in. iron rods through the stays and centre log crossways—



Place the two horizontal pulleys underneath the top log in such a position that the underlip of the spokes will just slide underneath when delivering and receiving the chain. Place the two perpendicular or tension pulleys in their place in the wallpost. Make a pulley for the chaffcutter, 8 in. solid wood with a groove 2 in. deep; put in sawcuts across the groove 2 in. deep; in these cuts place pieces of an old saw blade cut like this—



so as to almost meet in the groove. Around each end of pulley put an iron band; shrink it on hot. Rim the chain around the pulleys and spokes. This gear can be utilised either as a one, two, three, or four horse gear by simply putting in more horse levers crossways. The horse has a 24-ft. circle to walk in, and all the gear is above his head—nothing to step over. It will not gall a horse's shoulder.

This may seem a long rigmarole, but it is easier done than explained.

[This machine differs little in principle from the ordinary "whim" used for winding on new goldfields.—Ed. "Q.A.J."]

SNAKE BITES.

When we read the official reports of the numbers of people in India who are annually killed by the bites of snakes, numbers totalling last year nearly 25,000, and the year before over 30,000, we have reason to be very thankful for the forbearance of the venomous snakes of Queensland. Dr. F. Tidswell, M.B., in a most interesting pamphlet on "The Venoms of Australian Snakes (1906)," shows that in 87 cases of black-snake bites no deaths resulted. The tiger snake was responsible for 15 deaths out of 33 cases; the brown snake for 15 out of 32; and the death adder for 5 deaths out of 10 cases.

Arranged in order of lethality, the death adder appears as the most lethal snake (50 per cent. of deaths); but close to it comes the tiger snake (45·5 per cent. of deaths); next, but far below, comes the brown snake (fatality, 18·7 per cent.); and lastly comes the black snake, to which no fatality whatever is attached.

The bites recorded were most frequently incurred upon parts of the body which permitted of the application of a ligature. With reference to the administration of alcohol, the doctor says that it may be inferred that the administration of alcohol has no material effect in preserving life after bites by potentially deadly snakes. He also deprecates violent dragging about of the patient, but advises a ligature, thin scarification and sucking of the bite, and the giving of stimulants only if the patient is faint. No more should be done until the arrival of a medical man.

The following article appears in "Grenier's Rubber News":—Avoid two time-honoured tips—alcohol and exercise. It is impossible to push alcohol long enough to prevent its depressing effect, which usually appears at the very time the system requires every ounce of energy to combat the poison. Coffee has no subsequent depressing action. Give half a cupful every half-hour, or ring the changes with thirty-drop doses of sal volatile every second hour. Give a large quantity of fluids; the more fluid that is absorbed into the system the more diluted the poison is supposed to be. Don't walk the patient about. It merely exhausts a man who is about to make the hardest fight for his life. The walking game is not meant for the poison of the cobra or russel viper, the common snakes of the tropics. Give the victim rest, but keep him in a reclining or sitting posture. Immediately after a snake bite apply tourniquets both above and below the wound. Should the wound be on a bony part, like the instep, apply a ligature above the ankle as well. If you have a potassium permanganate outfit handy, use it. Crosscut deliberately and deep. Powder the crystals as finely as possible, and *rub them in*, Failing a potassium permanganate outfit, use a box of matches. Make deep crosscuts with a knife, knock of the match heads, fill the wound with them, and then, piling a few more on the surface, try amateur fireworks. If using potassium permanganate subsequently, don't forget to scrape out the burnt tissues. Try cupping as well. Wet the rim of a wineglass and the skin surrounding the wound; burn a little brandy or spirits in the glass, and before the flame is completely out clap the glass over the wound. If properly done, the skin will rise up within the glass.

COST OF FERTILISERS FOR MAIZE.

In the last issue of the journal, we gave the quantities and cost of three complete fertilisers for maize, as recommended by Mr. J. C. Brünnich, Agricultural Chemist. An error occurred in the addition of the cost per acre in the case of No. 3, in that 78/- was printed instead of 48/-.

Answers to Correspondents.

GRAIN CONTENT OF A WHEAT STACK.

Wheat-grower, Roma—

A stack, containing 160 cubic yards, should give 1 bushel of grain per cubic yard, so that your stack should be worth, at 4s. per bushel, £32.

CANTALOUPES.

Orchardist, Gympie—

The term "cantaloupe" applies properly only to a type of rough, warty, scabby melons grown in Europe, but rarely seen in the United States, where it has no specific meaning, as it is given there to all types of musk melons, or, as we call them in this State, rock melons. The Emerald Gem and Rocky Ford seed which we sent you are called Cantaloupes, but have nothing in common with them. The Rocky Ford is described, in an article on rock melons in a publication of the Orange Judd Company, U.S.A., as "decidedly the most important variety grown in the United States. It is of the Netted Gem type, oval in shape, about 5 inches long, and has the best flavour of any of the type. The Emerald Gem is small, globular, lightly netted, and of excellent quality.

NITRO-BACTERIA AND ROOT GALLS.

"M," Mossman—

The questions contained in your letter of 22nd October have been submitted to the Agricultural Chemist and to the Government Entomologist, who advise as follows:—

1. "Nitro-bacteria for different crops cannot be prepared on a small scale at home, as it requires scientific apparatus."—J. C. Brünnich.
2. Mr. Tryon says: "In my experience I have met with parties who have mistaken root-galls symptomatic of disease for the so-called bacterian nodules, and have actually disseminated the malady of which they are the symptom on their land. Accordingly, before doing what you propose, you should submit the nodules in question to us to see if they are really the products of Azobacteria. About kerosene and soap: You evidently have 'kerosene emulsion' in your mind. This is prepared according to the enclosed recipe—use 1 part to 15 or 20 parts of water, by volume. Artificial manure cannot be relied on for destroying aphides or plant lice."

LAND MEASUREMENT.

JAMES WRIGHT, "Dondale," Bowen—

The area of the land, according to the dimensions given by you, is 16 acres 0 roods 4 perches.

EGG-LAYING COMPETITION AT THE QUEENSLAND AGRICULTURAL COLLEGE.

O.P.Q., Yangarella, Indooroopilly.—

The highest record for any month during the College competitions was obtained by the Yangarella Poultry Farm with 173 eggs. It may be noted that on several occasions tallies of 172 eggs have been obtained from other pens.

FEEDING COWS—HORSES WITH COUGH.

YOUNG FARMER, Coominya—

1. The feed you mention is very beneficial in producing milk with rich butter fat.

2. Inferior chaff should not be given to the horses, as it is certain to produce bad effects. Damp all food before giving it to the animals. This, with good food, should bring about an improvement.

HARVESTING PEANUTS.

J. W. BROAD, Mount Garnet—

There is no machinery as yet for harvesting peanuts. The nuts are so small comparatively, the majority of soils more or less lumpy, and the matured nuts so easily detached that it is next to an impossibility to expect to handle a crop by any machine except when grown in a very friable soil which latter might be sifted out and the nuts left for the time being on a grating. This last is only a visionary idea of what might be and is still in the womb of the future.

LAMPAS—MANGE.

E.P.E., Binjour—

1. Your horse is apparently suffering from mange. The affected parts should be well washed with warm water and soap, allowed to dry, and then the following dressing applied once daily for three days:—

> Sulphur, 4 oz.; creolin, ½ oz.; linseed oil, 1 pint. Mix well together. This can be repeated after an interval of a week.

2. There is no necessity to cut or burn lampas; 2 oz. of Epsom salts dissolved in a bran mash, given for two or three days, will effect a cure.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR NOVEMBER, 1912.

Article.		NOVEMBER. Prices.
Bacon, Pineapple	lb.	9d. to 10½d.
Bran	ton	£6 15s.
Butter	cwt.	100s. to 114s.
Chaff, Mixed	ton	£6 to £7
Chaff, Lucerne	"	£4 10s. to £5
Chaff, Oaten (Victorian)	"	£7 15s.
Chaff, Oaten (Compressed)	"	£8 5s.
Chaff, Wheaten	"	£5 10s.
Cheese	lb.	7d. to 8½d.
Flour	ton	£10
Hay, Oaten (Victorian)	"	£8
Hay, Lucerne	"	£3 to £3 15s.
Honey	lb.	2¾d. to 3d.
Maize	bush.	4s. 2d. to 4s. 6d.
Oats	"	4s. 6d.
Pollard	ton	£7 10s.
Potatoes	"	£12 to £16
Potatoes, Sweet	cwt.	5s. to 9s. 5d.
Pumpkins	ton	£3 to £7 5s.
Wheat, Milling	bush.	5s. 4d.
Onions	ton	£20
Hams	lb.	1s. 1½d.
Eggs	doz.	9½d. to 11d.
Fowls	pair	4s. to 4s. 6d.
Geese	"	6s. to 7s.
Ducks, English	"	4s. to 6s.
Ducks, Muscovy	"	5s. 6d. to 6s. 6d.
Turkeys (Hens)	"	10s. to 12s.
Turkeys (Gobblers)	"	15s. to 24s.

SOUTHERN FRUIT MARKETS.

Apples (Choice), per bushel case	10s. to 17s.
Apples (Cooking), per bushel case	5s. to 10s.
Apricots, per quarter-case	9s. to 10s.
Bananas (Fiji), G.M., per bunch	4s. to 16s.
Bananas (Fiji), G.M., per case	9s. to 19s. 6d.
Bananas (Queensland), per bunch	2s. to 6s.
Bananas (Queensland) per case	14s. to 16s.
Cherries, per 12-lb. box	9s. to 12s.
Cocoanuts, per dozen	2s. 6d. to 3s.
Custard Apples, per quarter-case	5s. to 9s.
Gooseberries, per quarter-case	5s. to 7s. 6d.
Lemons (local), per gin case	6s. to 7s.
Lemons (Italian), per case	8s. to 14s.
Mandarins (Emperors), per case	8s. to 14s.
Mangoes (Queensland), per case	10s. to 14s.
Oranges (Navel), per gin case	— to 30s.
Oranges (other), per case	8s. to 16s.
Papaw Apples, per quarter-case	1s. 6d. to 3s.
Passion Fruit, per half-case	4s. to 10s.
Peanuts, per lb.	5d.

SOUTHERN FRUIT MARKETS—*continued.*

Article.	NOVEMBER. Prices.
Pineapples (Queensland), common, per case	5s. to 12s.
Pineapples (Queensland), Ripley's, per case	6s. to 12s.
Pineapples (Queensland), Queen's, per case	5s. to 12s.
Plums, per case	6s. to 8s.
Tomatoes, per half-case	2s. 6d. to 8s.
Watermelons (Queensland), per dozen	(in demand)
Cucumbers (Queensland), per bushel case	9s. to 10s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Article.	NOVEMBER. Prices.
Apples, American (Eating), per case	16s. to 18s.
Apples (Cooking), per case	6s. to 11s.
Bananas (Cavendish), per dozen	3d. to 4d.
Bananas (Sugar), per dozen	2½d. to 3d.
Cape Gooseberries, per case	6s. to 9s. 3d.
Cherries, per quarter-case	3s. to 7s. 6d.
Citrons, per cwt.	12s.
Custard Apples, per quarter-case...	4s. to 5s.
Gooseberries, per quart	9d.
Lemons, per case	7s. to 10s.
Mandarins, per case	7s. to 12s.
Mangoes, per case	...
Oranges (Navel), per case	8s. to 14s.
Oranges (Other), per case	7s. to 14s.
Papaw Apples, per quarter-case	1s. 6d. to 3s.
Passion Fruit, per quarter-case	4s. to 5s.
Peaches, per case...	8s. to 12s.
Peanuts, per lb.	3d. to 4d.
Pineapples (Ripley), per dozen	6s. to 9s.
Pineapples (Rough), per dozen	6s. to 9s.
Pineapples (Smooth), per dozen	6s. to 7s.
Rockmelons, per doz.	...
Strawberries, per dozen pint boxes	...
Tomatoes, per quarter-case	2s. to 6s. 3d.
Watermelons, per doz.	...

TOP PRICES, ENOGGERA YARDS, OCTOBER, 1912.

Animal.	OCTOBER. Prices.
Bullocks	£8 17s. to £10.
„ (Single)	...
Cows	£7 12s. 6d. to £9 2s. 6d.
Merino Wethers	25s.
Crossbred Wethers...	22s.
Merino Ewes	19s.
Crossbred Ewes	16s. 6d.
Lincoln Ewes	...
Shropshire Ewes	...
Lambs	19s.

Farm and Garden Notes for January.

FIELD.—The main business of the field during this month will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Great care must be exercised in the selection of seed potatoes to ensure their not being affected by the Irish Blight. Never allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum, teosinte, rye, and cowpeas. In some very early localities potatoes may be sown, but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole.

KITCHEN GARDEN.—A first sowing of cabbages, cauliflower, and Brussels sprouts may now be made in a covered seed bed, which must be well watered and carefully protected from insect pests. Sow in narrow shallow drills; they will thus grow more sturdy, and will be easier to transplant than if they were sown broadcast. The main points to be attended to in this early sowing are shading and watering. Give the beds a good soaking every evening. Mulching and a slight dressing of salt will be found of great benefit. Mulch may consist of stable litter, straw, grass, or dead leaves. Dig over all unoccupied land, and turn under all green refuse, as this forms a valuable manure. Turn over the heavy land, breaking the lumps roughly to improve the texture of the soil by exposure to the sun, wind, and rain. In favourable weather, sow French beans, cress, cauliflowers, mustard, cabbage, celery, radish, for Autumn and Winter use. Sow celery in shallow, well-drained boxes or in small beds, which must be shaded till the plants are well up. Parsley may be sown in the same manner. Turnips, carrots, peas, and endive may also be sown, as well as a few cucumbers and melon seeds for a late crop. The latter are, however, unlikely to succeed except in very favourable situations. Transplant any cabbages or cauliflowers which may be ready. We do not, however, advise such early planting of these vegetables, because the fly is most troublesome in February. For preference, we should defer sowing until March. Still, as "the early bird catches the worm," it is advisable to try and be first in the field with all vegetables, as prices then rule high. Cucumbers, melons, and marrows will be in full bearing, and all fruit as it ripens should be gathered, whether wanted or not, as the productiveness of the vines is decreased

by the ripe fruit being left on them. Gather herbs for drying; also garlic, onions, and eschalots as the tops die down.

FLOWER GARDEN.—To make the flower beds gay and attractive during the Autumn and Winter months is not a matter of great difficulty. Prepare a few shallow boxes. Make a compost, a great part of which should consist of rotten leaves. Fill the boxes with the compost, then sow thinly the seeds of annuals. Keep the surface of the soil moist, and when the young seedlings are large enough to handle lift them gently one by one with a knife or a zinc label—*never pull them up by hand*, as, by so doing, the tender rootlets are broken, and little soil will adhere to the roots. Then prick them out into beds or boxes of very light soil containing plenty of leaf mould. Then keep a sharp lookout for slugs and caterpillars. Keep a supply of tobacco dust on hand, and scatter this in the path of the slug, and he will cease from troubling you.

All kinds of shrubby plants may be propagated by cuttings. Thus, pelargoniums, crotons, coleus, and many kinds of tropical foliage plants can be obtained from cuttings made this month. After putting out cuttings in a propagating frame, shade them with a piece of calico stretched over it. Be careful not to over water at this season. Propagate verbenas, not forgetting to include the large scarlet Fox-hunter. Verbenas require rich soil. Palms may be planted out this month. If the weather prove dry, shade all trees planted out. With seed boxes, mulch, shade, water, and kerosene spray, all of which imply a certain amount of morning and evening work. The flower garden in Autumn and Winter will present a charming sight, and will afford light and profitable work for girls with spare time on their hands.

An exhaustive booklet on "Flower Gardening for Amateurs" has been issued by the Department of Agriculture and Stock, and may be obtained from the Office. Price 2s.

Orchard Notes for January.

THE SOUTHERN COAST DISTRICTS.

The fruit of the month in this part of the State is the grape, and its gathering and marketing will occupy the attention of growers. Care should be taken to cut the fruit when cool and dry, and if it has to be sent any distance the stems of the bunches should be allowed to wilt before the fruit is packed, as the berries will then hang on to the bunch

better, and the bunch carry in better order. Select the fruit carefully, grade it, and pack firmly so that it will not bruise in transit. If to be sent long distances, pack in crates holding from four to six 6-lb. baskets. Pines will be ripening in quantity towards the end of the month. Gather before fully coloured, and, whether for Southern or local markets, pack and handle carefully to prevent bruising. Do not ship the fruit too green for the Southern markets, as doing so is apt to spoil the trade. Send good fruit to the canneries. Small pines and crippled fruit are no good to canners, and the sooner our growers realise that it only pays to grow good fruit the better for them and for the canners, as if the latter cannot get good fruit it is impossible for them to put a line of goods that will not only be a credit to the State, but for which a world-wide market can be obtained.

Passion fruit should not be allowed to lie about for days on the ground before gathering, as if so they are apt to become fly-infested.

Water melons and rock melons are still in season.

Watch any late peaches, Japanese plums, or other fruits liable to be infested with fruit fly, and gather and destroy all infested fruit, or, better still, grub the trees out and burn them, as they only breed flies to destroy more valuable fruit. Mangoes will be ripening during the month. See that all fly-infested fruits are destroyed, as they will only breed up further crops to destroy later ripening fruits.

Citrus orchards can be cyanided during the month for scale insects, and spraying for Maori with the sulphide of soda wash should be continued where necessary.

Mangoes can be budded during the month, as well as citrus and deciduous trees. Tropical fruit trees can be transplanted, taking care to choose dull weather and to cover same from the direct rays of the sun till they have become firmly established. Pines and bananas can still be planted.

THE TROPICAL COAST DISTRICTS.

See that all bananas are covered with netting, as the fly is usually at its worst at this time of year.

Mangoes will be going off. See that they are not allowed to remain about on the ground to breed flies for the Autumn crop of oranges. Longan, litchi, and other fruit are in season. As the month is often a very wet one, little cultivation can be done in the orchards. Strong undergrowth should, however, be kept down with a hoe or scythe. Tropical fruits of all sorts can be planted. Look out for Maori on citrus fruits, and spray when necessary.

THE SOUTHERN AND CENTRAL TABLELANDS.

January is a busy month in the Stanthorpe district, apples, pears, plums, peaches, and nectarines being in season. Do not gather the fruit too immature; at the same time, don't allow it to be over-ripe. Gather dry, handle carefully, grade and pack in attractive cases. Keep the fruit as cool as possible, and ship in well-ventilated cars. Keep a sharp lookout for fruit fly, and take every possible means to prevent its spreading, even going as far as to gather and destroy the whole of the fruit on any infected trees, as if kept in check during the month the bulk of the fruit ripening during February will be free.

Keep a sharp lookout also for codling moth, examine the bandages on the trees at least every ten days, and destroy all larvæ found therein; also gather and destroy all moth-infected fruit.

Gather Bartlett pears as soon as they are large enough, and store away in a cool shed to ripen; when they show signs of ripening, market, not before. If sent down green they will sell for cooking, and only fetch a small price. The right stage at which to gather is when the fruit is fully developed, and the flesh has lost its woody flavour, but is still quite hard. This is usually before the fly has stung it, and if gathered at this stage the fruit will ripen up properly without shrivelling, and develop its full flavour.

These remarks apply also to the Downs country, which is somewhat earlier than Stanthorpe.

The crop of the month in the Western tablelands is the grape; and the remarks I have made respecting this fruit when grown in the Southern Coast districts apply equally here. The fruit should be gathered dry, and wilted before it is packed. Too large cases are often used; cases holding from 20 to 30 lb., or crates holding six 6-lb. baskets, are preferable, the latter being the best package for shipping the fruit long distances. Keep the orchards well cultivated, and, where water for irrigation is available, give citrus trees a watering during the month, unless there has been a sufficient rainfall. When the orchard is irrigated, see that thorough cultivation follows the irrigation, so as to conserve the moisture in the soil.

Red Scale, which is prevalent on citrus trees in the dry Western country, should be treated during the month. Cyaniding is the best remedy.

N.G.T.